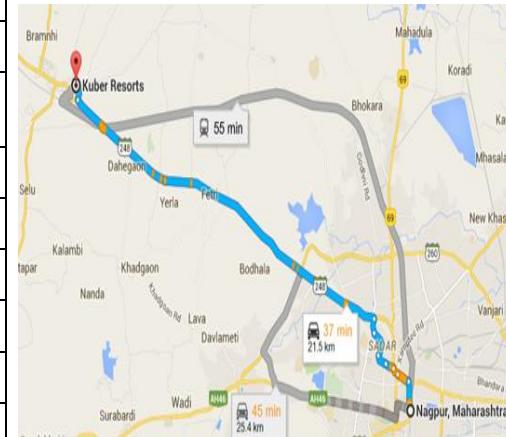




APPROVED BY AICTE , DTE, NAAC ACCREDITED , ISO 14001:2015 Certified Institution  
& AFFILIATED TO RTM NAGPUR UNIVERSITY , NAGPUR  
Dahegaon , Opp. IOC Petrol Pump , Kalmeshwar Road , Nagpur-441501 Ph:- 07118-661450  
Website : [www.gninagpur.info](http://www.gninagpur.info) E-mail : [gni.principalgnit@gmail.com](mailto:gni.principalgnit@gmail.com)

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|--|--|
| <b>Mandatory Disclosure</b>                      |  |
| AICTE File No.                                   | F.No. Western/1-9321925087/2021/EOA                              |
| Date & Period of last approval                   | 25 <sup>th</sup> June 2021 (2021-2022)                           |
| Name of Institution                              | Guru Nanak Institute of Engineering & Technology                 |
| Address of the Institution                       | Dahegaon, Kalmeshwar Road, Nagpur Maharashtra                    |
| City & Pin Code                                  | Nagpur-441501  |
| State / UT                                       | Maharashtra  |
| Longitude & Latitude                             | 21.221174<br>78.947155   |
| Phone number with STD code                       | 07118-661400   |
| Fax number with STD code                         | 07118-661410   |
| Office hours at the Institution                  | 9.00 am to 4.00 pm   |
| Academic hours at the Intuition                  | 9.00 am to 4.00 pm   |
| Email  | <a href="mailto:grietnagpur@gmail.com">grietnagpur@gmail.com</a> |
| Website  | <a href="http://www.griet.ac.in">www.griet.ac.in</a>             |
| Nearest Railway Station (dist in Km)             | Kalmeshwar (3Km)   |
| Nearest Airport (dist in Km)                     | Nagpur (20Km)  |
| Type of Institution                              | Private- Self Financed   |
| Category (1) of the Institution                  | Minority : Non-Minority  |
| Category (2) of the Institution                  | Co-Ed  |
| Name of the Organization running the Institution | Guru Nanak Educational Society                                   |
| Type of the organization                         | Society  |
| Address of the organization                      | Plot No. 2, Samved Sakul, Civil Lines, Nagpur-440001 Maharashtra |



|  |  |
|--|--|
| Registered with                            | Sub registrar of Society, Nagpur                                       |
| Registration date                          | 27/7/2006  |
| Website of the organization                | <a href="http://www.gnietedu.com">www.gnietedu.com</a>                 |
| Name of the affiliating University / Board | Rashtrasant Tukdoji Maharaj Nagpur University                          |
| Address                                    | Rabindranath Tagore Marg, Sitabuldi,<br>Nagpur-440001                  |
| Website                                    | <a href="http://www.nagpuruniversity.org">www.nagpuruniversity.org</a> |
| Latest affiliation period                  | 2021-2022  |

|  |  |
|--|--|
| Name of Principal/ Director                  | Dr. Hemant Hajare  |
| Exact Designation                            | Principal  |
| Phone number with STD code                   | 07118-661400   |
| FAX number with STD code                     | 07118-661410   |
| Email  | <a href="mailto:gnielnagpur@gmail.com">gnielnagpur@gmail.com</a>   |
| Highest Degree                               | Ph.D   |
| Field of specialization                      |  |
| Governing Board Members                      |  |
| Frequency of meetings & date of last meeting | Meeting of the Board is held every six months. Special Board Meetings are held on short notices in emergency situations. |
|  |  |

➤ **Name and address of the Trust/ Society/ Company/ and the Trustees:**

- Name of the Parent Organization (Trust/ Society/ Company) : Guru Nanak Educational Society Nagpur.
- Type of the Organization (Trust/ Society/ Company) : Society
- Registered With : Sub Registrar Of Society, Nagpur
- Registration Date : 07/27/2006
- Registration Number : 577/06
- Organization Address :

Plot No. 2, Ground Floor, Samved Sankul, Near Mla Hostel, Civil Lines, District: Nagpur, State/UT: Maharashtra, Town / City / Village :Nagpur ,PIN :440001  
Land Phone STD Code : 712 ,Land Phone Number :2546333  
PAN :AAATG9721E Organization Website :[www.gnit.in](http://www.gnit.in)

| Sr. No.  | Name            | Designation | Trustee Since | Mobile No.        |
|----------|-----------------|-------------|---------------|-------------------|
| <b>1</b> | Tavinder Singh  | President   | 07/27/2006    | 9849641828        |
| <b>2</b> | Navneet Singh   | Chairman    | 07/27/2006    | 9823043430        |
| <b>3</b> | Tanpreet Kaur   | Secretary   | 07/27/2006    | 9823043430        |
| <b>4</b> | Inder Kaur      | Member      | 07/27/2006    | <b>9849641828</b> |
| <b>5</b> | Gurpriya Kaur   | Member      | 07/27/2006    | 9849641828        |
| <b>6</b> | Gagandeep Singh | Member      | 07/27/2006    | 9849641828        |
| <b>7</b> | Surinder Kaur   | Member      | 07/27/2006    | 9849641828        |

- **Name of affiliating University:** Rashtrasant Tukdoji Maharaj Nagur University, Nagpur
- **Governance:**
  - **Members of the Board and their Brief Background:**

GNIET/4D/Circular/21-22/

Dated: 11/01/2022

The Board of Governors is a statutory body formed under Dr. Hemant Hajare (Chairperson College Development Committee) as per direction 2016 Act 96 (1) of RTMNU for smooth conduction & development of activities in the institute for the academic year 2022-23, 2023-24, 2024-2025.

### **Board of Governors**

| Sr. No. | Name                      | Profession                                | Designation |
|---------|---------------------------|---|-------------|
| 01      | Sardar Navneet Singh Tuli | Educationists/Industrialist               | Chairman    |
| 02      | Mrs. Tanpreet Kaur Tuli   | Social Worker                             | Member      |
| 03      | Dr. Sudhir Shelke         | Director GNES                             | Member      |
| 04      | Dr. Hemant Hajare         | Principal GNIET                           | Member      |
| 05      | Dr. Rajendra Kakde        | Advisor, AICTE                            | Member      |
| 06      | Dr. Manoj Daigavane       | Joint Director DTE, Nagpur                | Member      |
| 07      | Er. Milind Pathak         | Director Elesun System Pvt. Ltd.          | Member      |
| 08      | Dr. Pranav Mehar          | Prolific Systems & Technologies Pvt. Ltd. | Member      |
| 09      | Prof. Rajendra Bhombe     | HOD, EE                                   | Member      |
| 10      | Prof. Neha Chourasia      | HOD, ETCg                                 | Member      |
| 11      | Prof. Sadaf Gauhar        | HOD, ASH                                  | Member      |

Principal, GNIET

**GNIET/ 4D/Circular/2021-22/**

**Date:- 24/03/2022**

**Research Advisory Committee**

Research Advisory Committee at Institute level, responsible for regulating and implementing different Research activities has been formed for the session 2021-22.

| <b>Committee</b>        | <b>Name</b>  | <b>Designation</b>  |
|-------------------------|--|---|
| <b>Chairman</b>         | Dr. Hemant Hajare  | Principal, GNIET  |
| <b>Coordinator</b>      | Prof. Sandip Buradkar  | Assistant Professor, ETC  |
| <b>Members</b>          | Prof. Rajendra Bhombe<br>Prof. Neha Chourasia<br>Prof. Ayaz Khan<br>Prof. Sadaf Gauhar<br>Dr. Jonathan Joseph<br>Prof. Diksha Khare<br>Dr. Vivek Korde<br>Prof. Manish Agrawal | Vice Principal, GNIET & HOD, EE<br>HOD, ETC<br>HOD, CSE<br>HOD, ASH<br>HOD, MBA<br>Assistant Professor, EE<br>Assistant Professor, ASH<br>Assistant Professor, EE |
| <b>Advisory Members</b> | Dr. Anant Pande<br>Dr. Neeraj Khaty  | Director, R & D, Y.C.C.E., Nagpur<br>Professor, L.I.T., Nagpur  |

**Principal**

**G.N.I.E.T., Nagpur**

**Copy to (For Information):-**

- 1) Hon'ble Director, GNES
- 2) Vice – Principal, GNIET
- 3) Associate Dean, GNIET
- 4) All HODs (ETC/EE/CSE/ASH/MBA)
- 5) R & D Coordinator

GNIET/ 4D/Circular/21-22/

Date: - 03/01/2022

### **Academic Advisory Committee**

Academic Advisory Committee at Institute level, responsible for regulating and implementing different academic activities has been formed for the Academic Year-2021-22.

The Members are as under

Chairman : Dr. Hemant Hajare, Principal, GNIET

Coordinator : Prof. Neha Chourasia, Associate Dean (Academics) & HOD ETC

Members : Prof. Rajendra Bhombe, Vice-Principal & HOD EE

Dr. Jonathan Joseph, HOD MBA

Prof. Ayaz Khan, HOD CSE

Prof. Sadaf Gauhar, HOD ASH

Advisory Member: - Dr. Nitin Ghawghewar,  
 Professor & Head of Department, Electrical Engineering,  
 Government College of Engineering, Nagpur.

Dr. Rajesh Dhoble,  
 Professor, Civil Engineering Department,  
 Priyadarshini College Of Engineering, Nagpur

Dr. Mangesh Kotambakar,  
 Associate Professor, Mechanical Engineering Department,  
 Visvesvaraya National Institute of Technology, Nagpur.

Principal  
 G.N.I.E.T., Nagpur

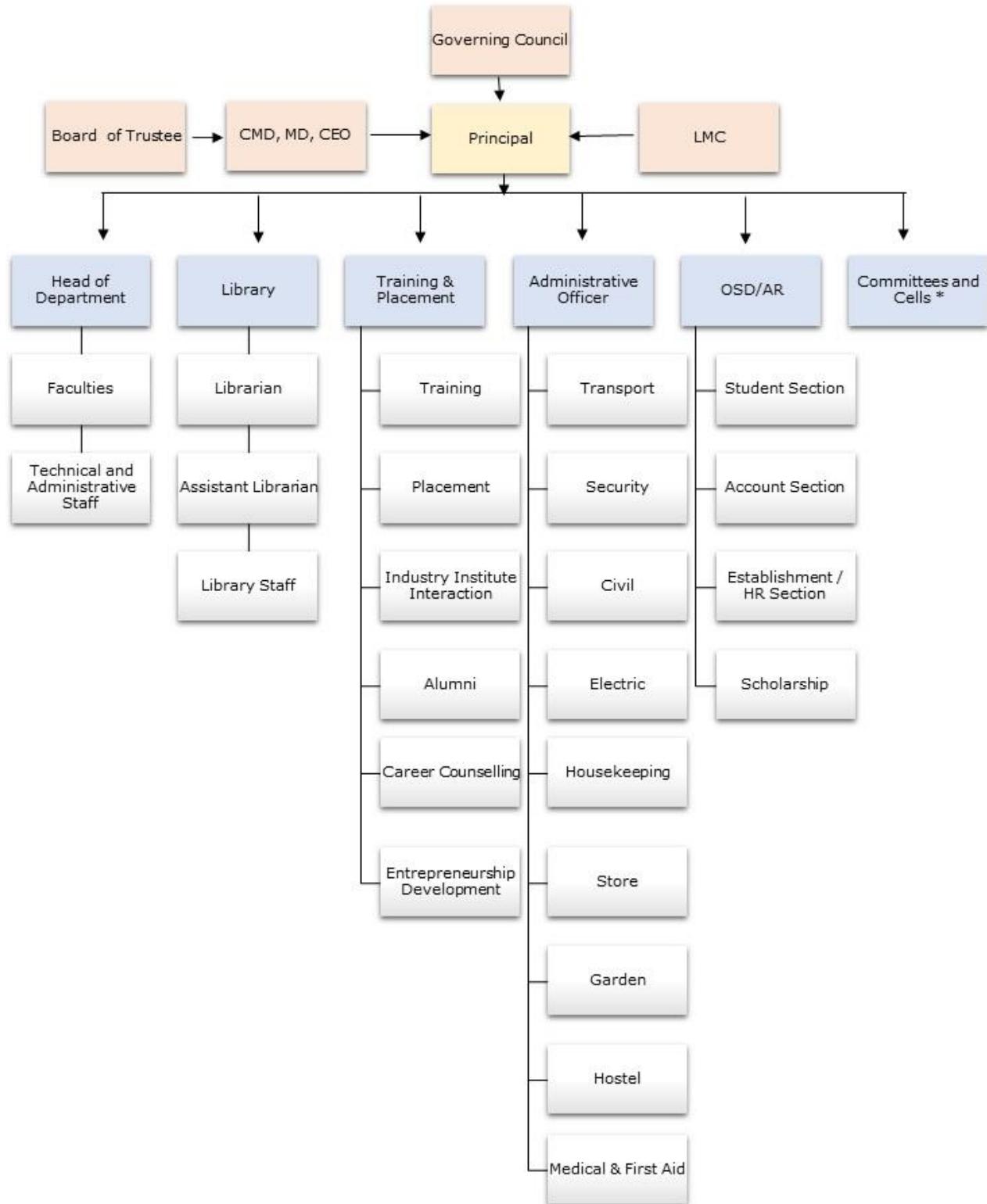
Copy to (For Information):-

- 1) Hon'ble Director, GNES
- 2) Vice – Principal, GNIET
- 3) Associate Dean, GNIET
- 4) All HODs (ETC/EE/CSE/ASH/MBA)

- **Frequency of the Board Meeting and Academic Advisory Body:**

Meeting of the Board is held every six months. Special Board Meetings are held on short notices in emergency situations.

- **Organizational Chart and Processes:**



GNIET/4D/Circular/21-22/1719

Date : 17/08/2021

## Anti Ragging Committee

### **What is Ragging?**

Ragging is neither a means of familiarization, nor an introduction with freshers, but a form of psychopathic behavior. Ragging is a violation of human rights. Ragging is a heinous crime, heavily punishable under law. Ragging may spoil your career forever. All measures for prevention of ragging in campus are being taken as per the Anti Ragging Supreme Court verdict 2007. As per regulations dated 1.7.2009 of All India Council for Technical Education (AICTE), the student has to sign and submit an anti-ragging affidavit at the time of registration to semester/year. The parent also has to sign and submit an anti-ragging affidavit.

### **Ragging Involves:**

- Any disorderly conduct whether by words or written or by an act which has the effect of teasing or handling with rudeness a fresher or a junior student or an admission aspirant student.
- Indulging in rowdy or indiscipline activity which causes or likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in fresher or junior student.
- Asking a junior or fresher student to do any act or perform something which a student will not do in an ordinary course and which has the effect of causing or generating a sense of shame or embarrassment so as to adversely affect the psyche of a fresher or a junior student
- Asking a junior or fresher student to copy and/or prepare notes, lend money or any act that may adversely affect the psyche of a fresher or a junior student.
- Any act of corporal contact, touching, pushing, thrashing, scratching, beating or any physical harm to fresher or junior student.

## **Who is Culprit?**

Any student or group of students who tries to harm or intent to harm directly or indirectly a fresher or junior student as pointed out above is an offender and liable to be punished fittingly.

- Immediate suspension from the college
- Cancellation of admission
- Information regarding participation in ragging will be mentioned in the Transfer Certificate, if issued.
- Ragger will not be given admission in any institute of India for the next five years.  
Previous school/college will be informed about the action taken and no duplicate TC will be issued to the ragger by that institute.
- Awaited examination result will be withheld. Action like stay or suspension and recovery of all the scholarship if paid any, will be taken.
- An FIR of the incident related to ragging will be lodged against ragger in the Police Station. A case of violent and heinous crime will be registered suitably to proceed in the Honorable Court.

## **Anti Ragging Committee**

| Sr No. | Name of the Faculty   | Designation     | Committee Post | Contact Number |
|--------|---|-----------------|----------------|----------------|
| 1      | Prof. Kishor Wagh<br><a href="mailto:kishor_25may@rediffmail.com">kishor_25may@rediffmail.com</a> | Asst. Professor | Chair Person   | 9881204567     |
| 2      | Prof. Kalpana Malpe<br><a href="mailto:kmalpe@gmail.com">kmalpe@gmail.com</a>                     | Asst. Professor | Member         | 9970086417     |
| 3      | Prof. Ayaz Khan<br><a href="mailto:ayazkhan.gniet@gmail.com">ayazkhan.gniet@gmail.com</a>         | HOD, CSE        | Member         | 7020667537     |
| 4      | Dr. Jonathan Joseph<br><a href="mailto:josephjonathan51@gmail.com">josephjonathan51@gmail.com</a> | HOD, MBA        | Member         | 9665810350     |
| 5      | Prof. Ekta Meshram<br><a href="mailto:meshramekta962@gmail.com">meshramekta962@gmail.com</a>      | HOD, ASH        | Member         | 9764093405     |

### **Anti Ragging Sqaud**

| <b>Sr<br/>No.</b> | <b>Name of the Faculty</b>   | <b>Designation</b>         | <b>Committee<br/>Post</b> | <b>Contact<br/>Number</b> |
|-------------------|--|----------------------------|---------------------------|---------------------------|
| 1                 | Prof. Rajendra Bhombe<br><a href="mailto:rnsbhombe@gmail.com">rnsbhombe@gmail.com</a>        | Vice-Principal<br>/HOD, EE | Chair Person              | 9881204567                |
| 2                 | Prof Sadaf Gauhar<br><a href="mailto:hod.fy.gniet@gmail.com">hod.fy.gniet@gmail.com</a>      | HOD, ASH                   | Member                    | 9822269240                |
| 3                 | Prof. Diksha Khare<br><a href="mailto:dipavali_786@yahoo.co.in">dipavali_786@yahoo.co.in</a> | Asst. Professor            | Member                    | 9421919837                |
| 4                 | Prof. Vijaya Kamble<br><a href="mailto:sairamvijaya@gmail.com">sairamvijaya@gmail.com</a>    | Asst. Professor            | Member                    | 9850917133                |
| 5                 | Dr.Jaspal Gidwani<br><a href="mailto:jaspal.gidwani@gmail.com">jaspal.gidwani@gmail.com</a>  | Asst. Professor            | Member                    | 9766285304                |

Principal  
G.N.I.E.T., Nagpur

GNIET/4D/Circular/21-22/1718

Date: 17/08/2021

### **Grievance Redressal Committee**

The objective of the Grievance Cell is to develop a responsive and accountable attitude among all the stakeholders in order to maintain a harmonious educational atmosphere in the institute. The function of the cell is to look into the complaints lodged by any student, Parent or staff and judge its merit. The Grievance cell is also empowered to look into matters of harassment. Anyone with a genuine grievance may approach the faculty members in person, or the officer in-charge Students' Grievance Cell. In case the person is unwilling to appear in self, grievances may be dropped in writing at the suggestion box kept at the Main Block entrance. They can also submit their grievance online through College login portal allotted to them.

Grievances Redressal committee shall receive and redress grievances reported of following issue:

- Academic issues: pertaining to teaching learning activities.
- Student-teacher, student - student relationship.
- Internal evaluation and assessment marking.
- Complaint related to library and IT services.
- Grievances related to hostel, food, water, electricity, safety, security etc.
- Grievance related to transport facilities.
- Grievances related to sports, cultural, and selection process etc.
- Grievances related to women issues and harassment. However they are specifically redressed by women welfare and anti-sexual harassment committee.
- Grievance related to ragging; however, the matter is referred to anti-ragging committee for appropriate redressal.
- Grievances related to internal examination.
- Grievances related to behavioural of office staff.
- Grievances related to delay in issuance of records and documents

## Members

| Sr No. | Name   | Designation             | Committee Post | Contact Number |
|--------|--|-------------------------|----------------|----------------|
| 1      | Prof. Rajendra Bhombe<br><a href="mailto:rnsbhombe@gmail.com"><u>rnsbhombe@gmail.com</u></a>             | Vice-Principal /HOD, EE | Chair Person   | 9881204567     |
| 2      | Prof. Neha Chaurasia<br><a href="mailto:gnietetc123@gmail.com"><u>gnietetc123@gmail.com</u></a>          | Dean/HOD, ETC           | Member         | 9130007084     |
| 3      | Prof. Ayaz Khan<br><a href="mailto:ayazkhan.gniet@gmail.com"><u>ayazkhan.gniet@gmail.com</u></a>         | Hod, CSE                | Member         | 7020667537     |
| 4      | Prof Sadaf Gauhar<br><a href="mailto:hod.fy.gniet@gmail.com"><u>hod.fy.gniet@gmail.com</u></a>           | HOD, ASH                | Member         | 9822269240     |
| 5      | Dr. Jonathan Joseph<br><a href="mailto:josephjonathan51@gmail.com"><u>josephjonathan51@gmail.com</u></a> | HOD, MBA                | Member         | 9665810350     |

Principal  
G.N.I.E.T., Nagpur

GNIET/4D/Circular/21-22/1716

Dated: 17/08/2021

### Internal Complaint Committee

Internal Complaint Committee (ICC) as per sec 4 All India Council for Technical Education (Gender sensitization Prevention and prohibition of sexual Harassment of women Employees & students and Redressal of Grievances in Technical Institutions has been formed for the session 2021-22.

| Sr.<br>No. | Name of faculty   | Designation     | Committee<br>Post | Mobile No. |
|------------|---|-----------------|-------------------|------------|
| 1          | Prof. Diksha Khare<br><a href="mailto:dipavali_786@yahoo.co.in">dipavali_786@yahoo.co.in</a>        | Asst. Professor | Chair Person      | 9421919837 |
| 2          | Prof. Amar Banmare<br><a href="mailto:amarbanmare1978@gmail.com">amarbanmare1978@gmail.com</a>      | Asst. Professor | Member            | 8329276450 |
| 3          | Dr. Roshni Halmore<br><a href="mailto:roshnihalmore10@gmail.com">roshnihalmore10@gmail.com</a>      | Asst. Professor | Member            | 9527663723 |
| 4          | Prof. Sadaf Gauhar<br><a href="mailto:sadafgauhar@rocketmail.com">sadafgauhar@rocketmail.com</a>    | Asst. Professor | Member            | 9822269240 |
| 5          | Prof. Rajendra Katole<br><a href="mailto:raju_katole@rediffmail.com">raju_katole@rediffmail.com</a> | Asst. Professor | Member            | 8788612881 |
| 6          | Prof. Ayaz Khan<br><a href="mailto:ayazkhan.gniit@gmail.com">ayazkhan.gniit@gmail.com</a>           | Asst. Professor | Member            | 7020667537 |
| 7          | Mr. Prashant Jaulakar<br><a href="mailto:jaulkarprashant@gmail.com">jaulkarprashant@gmail.com</a>   | Clerk           | Member            | 8208739782 |
| 8          | Mr. Dyaneshwar Admane<br><a href="mailto:dnyanamadhu@gmail.com">dnyanamadhu@gmail.com</a>           | Clerk           | Member            | 8788858943 |
| 9          | Ms. Ankita Tiwari<br><a href="mailto:ankitatiwari2211@gmail.com">ankitatiwari2211@gmail.com</a>     | Student         | Member            | 7774842211 |
| 10         | Ms. Ashwini Raut<br><a href="mailto:ashwiniraut512@gmail.com">ashwiniraut512@gmail.com</a>          | Student         | Member            | 9404356266 |
| 11         | Mr. Sumit Kathe<br><a href="mailto:sumitkathe173@gmail.com">sumitkathe173@gmail.com</a>             | Student         | Member            | 9527713064 |

Principal

G.N.I.E.T., Nagpur

Copy to (For Information):-

- 1) Hon'ble Director, GNES
- 2) Vice - Principal, GNIET
- 3) All HODs (ETC/EE/CSE/ASH/MBA)

➤ **Programmes:**

**Name of Programmes approved by AICTE:**

| Sr. No . | Course Name                      | Level | FT / PT | Affiliating Body / University                        | Intake Approved 2020-21 | Intake Approved 2021-22 | Applied For | Applied Intake 2022-23 |
|----------|----------------------------------|-------|---------|--|-------------------------|-------------------------|-------------|------------------------|
| 1        | Computer Science & Engineering   | PG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 24                      | 24                      | EOA only    | 24                     |
| 2        | Power Electronics & Power System | PG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 24                      | 24                      | EOA only    | 24                     |
| 3        | MBA                              | PG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 60                      | 60                      | EOA only    | 60                     |
| 4        | Electrical Engg.                 | UG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 60                      | 60                      | EOA only    | 60                     |
| 5        | Electronics & Telecommunication  | UG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 120                     | 120                     | EOA only    | 120                    |
| 6        | Computer Science & Engineering   | UG    | FT      | Rashtrasant Tukdoji Maharaj Nagur University, Nagpur | 120                     | 120                     | EOA only    | 120                    |

| Sr. No. | Course Name                      | No. of Seats | Duration | Fees ( As approved by the state government) | Placement Facilities   |
|---------|----------------------------------|--------------|----------|---|--|
| 1       | Computer Science & Engineering   | 24           | 2 Years  | 96,000/-                                    | Centralized Training and Placement Cell for the placement of the students. |
| 2       | Power Electronics & Power System | 24           | 2 Years  | 96,000/-                                    |  |
| 3       | Electrical Engg.                 | 60           | 4 Years  | 76,000/-                                    |  |
| 4       | Electronics & Telecommunication  | 120          | 4 Years  | 76,000/-                                    |  |
| 5       | Computer Science & Engg.         | 120          | 4 Years  | 76,000/-                                    |  |
| 6       | MBA                              | 60           | 2 Years  | 90,000/-                                    |  |

➤ Faculty:

| Sr. No | Name                       | Date of Joining | Designation     | Experience | Qualification           | Contact Number |
|--------|----------------------------|-----------------|-----------------|------------|-------------------------|----------------|
| 1      | Dr. Hemant V. Hajare       | 3/1/2022        | Principal       | 25 yrs     | B.E., M. Tech., Ph.D    | 9881713211     |
| 1      | Dr. Sanjeev N. Shrivastava | 20/08/2008      | Professor       | 21 yrs     | B.Sc, M.Sc, M.Tech Ph.D | 9765569233     |
| 2      | Mr. Ayaz Ahmad Khan        | 15/06/2009      | Asst. Professor | 12 yrs     | BE, M.Tech              | 9423088786     |
| 3      | Ms. Pranjali K Padole      | 12/05/2021      | Asst. Professor | 2 yrs      | BE, M.Tech              | 7972558237     |
| 4      | Ms. Ankita Gaware          | 14/12/2018      | Asst. Professor | 3 yrs      | BE, M.Tech              | 7385049130     |
| 5      | Ms. Minal                  | 21/06/2013      | Asst.           | 9 yrs      | BE, M.Tech              | 9823350344     |

|    |                           |            |                 |        |                   |            |
|----|---------------------------|------------|-----------------|--------|-------------------|------------|
|    | Ukinkar                   |            | Professor       |        |                   |            |
| 6  | Ms. Ashwini Urade         | 01/06/2017 | Asst. Professor | 4 yrs  | BE, M.Tech        | 8055483544 |
| 7  | Ms. Nidhi M. Shelkar      | 22/11/2021 | Asst. Professor | 1 yr   | BE, M.Tech        | 9503002381 |
| 8  | Ms. Shubhangi V Ghadinkar | 03/02/2022 | Asst. Professor | 1 yr   | BE, M.Tech        | 9175447705 |
| 9  | Mr. Buddheshwar Borkar    | 04/01/2022 | Asst. Professor | 1 yr   | BE, M.Tech        | 7507001710 |
| 10 | Buddheshwar Borkar        | 28/03/2022 | Asst. Professor |        |                   |            |
| 11 | Shweta Ramteke            | 18/04/2022 | Asst. Professor |        |                   |            |
| 12 | Ms. Akansha S Kale        | 21/02/2022 | Asst. Professor | 2 yrs  | BE, M.Tech        | 8805494644 |
| 13 | Ms. Kalpana Malpe         | 01/07/2008 | Asst. Professor | 10 yrs | BE, M.Tech        | 9970086417 |
| 14 | Ms. Vijaya Kamble         | 18/05/2015 | Asst. Professor | 14 yrs | BE, M.Tech        | 9850917133 |
| 15 | Mr. Yogesh Wankar         | 04/11/2016 | Asst. Professor | 5 yrs  | B.Sc, MCA, M.Tech | 9403908309 |
| 16 | Mr. Rajendra Bhombe       | 01/10/2007 | Asst. Professor | 15 yrs | BE, M.Tech        | 9881204567 |
| 17 | Mr. Akshay Pillewan       | 02/06/2017 | Asst. Professor | 3 yrs  | BE, M.Tech        | 8390578055 |
| 18 | Mr. Pradeep Barde         | 06/01/2012 | Asst. Professor | 9 yrs  | BE, M.Tech        | 9970139739 |
| 19 | Ms. Kavita Patil          | 03/01/2017 | Asst. Professor | 4 yrs  | BA, MBA           | 8999547721 |
| 20 | Mr. Milind R Rode         | 20/05/2021 | Asst. Professor | 6 yrs  | BE, M.Tech        | 8087177429 |
| 21 | Ms. Kanchan Bande         | 23/07/2021 | Asst. Professor | 10 yrs | BE, M.Tech        | 9823990078 |
| 22 | Mr. Manishkumar Agrawal   | 31/05/2021 | Asst. Professor | 5 yrs  | BE, M.Tech        | 9975578626 |
| 23 | Ms. Ishita Dupare         | 01/02/2014 | Asst. Professor | 7 yrs  | BE, M.Tech        | 9766171687 |
| 24 | Ms. Sarshwati Mishra      | 15/06/2015 | Asst. Professor | 6 yrs  | B.Tech, M.Tech    | 8626087605 |
| 25 | Mr. Yogesh Gajbhiye       | 02/05/2016 | Asst. Professor | 5 yrs  | BE, M.Tech        | 9021099050 |
| 26 | Ms. Sneha Masarkar        | 28/07/2016 | Asst. Professor | 5 yrs  | BE, M.Tech        | 9579206565 |
| 27 | Ms. Rutuja Zade           | 01/11/2019 | Asst. Professor | 3 yrs  | BE, M.Tech        |            |

|    |                             |            |                 |         |                     |            |
|----|-----------------------------|------------|-----------------|---------|---------------------|------------|
| 28 | Ms. Sayeda Saba Khan        | 03/01/2017 | Asst. Professor | 4 yrs   | BE, M.Tech          |            |
| 29 | Ms. Ankita Bhimgade         | 22/11/2021 | Asst. Professor | 1 yr    | BE, M.Tech          | 9146119764 |
| 30 | Ms. Pallavi P Barekar       | 12/01/2021 | Asst. Professor | 1 yr    | BE, M.Tech          | 8329800435 |
| 31 | Mr. Hitesh Murkute          | 12/05/2015 | Asst. Professor | 8.5 yrs | BE, M.Tech          | 9403305231 |
| 32 | Ms. Diksha Khare            | 07/09/2012 | Asst. Professor | 9 yrs   | BE, M.Tech          | 9421919837 |
| 33 | Mr. Yogesh Likhar           | 02/07/2018 | Asst. Professor | 3 yrs   | BE, M.Tech          | 9425845444 |
| 34 | Mr. Amar Banmare            | 21/05/2011 | Asst. Professor | 11 yrs  | BE, M.Tech          | 9764131862 |
| 35 | Mr. Deepak Deshpande        | 20/05/2015 | Asst. Professor | 14 yrs  | BE, M.Tech          | 8956128428 |
| 36 | Ms. Nayan Shambharkar       | 01/07/2016 | Asst. Professor | 5 yrs   | BE, M.Tech          | 7387287546 |
| 37 | Ms. Vrushali Ailwar         | 15/11/2018 | Asst. Professor | 5 yrs   | BE, M.Tech          | 9766444166 |
| 38 | Ms. Kajal Dhawale           | 04/07/2019 | Asst. Professor | 2 yrs   | BE, M.Tech          | 8329990326 |
| 39 | Mr. Yeshwant Deodhe         | 09/05/2021 | Asst. Professor | 19 yrs  | BE, M.Tech          | 8766560132 |
| 40 | Mrs. Meher Lalwani          | 16/07/2021 | Asst. Professor | 4 yrs   | B.E.                | 7709688842 |
| 41 | Ms. Harana M Bodele         | 24/01/2022 | Asst. Professor | 10 yrs  | BE, M.Tech, Ph.D*   | 9604345551 |
| 42 | Mr. Abhay Satmohankar       | 15/09/2017 | Asst. Professor | 9 yrs   | BE, M.Tech          | 9168279507 |
| 43 | Mr. Sandeep Buradkar        | 21/03/2022 | Asst. Professor | 17 yrs  | B.E. , M.Tech       | 9890721992 |
| 44 | Mr. Nilesh Mohata           | 04/01/2022 | Asst. Professor | 16 yrs  | BE, M.Tech          | 9011000809 |
| 45 | Dr. Vivek B Korde (Phy)     | 22/07/2021 | Asst. Professor | 8 yrs   | B.Sc., M. Sc., Ph.D | 8788080733 |
| 46 | Mr. Kishor Wagh (EG)        | 15/06/2009 | Asst. Professor | 14 yrs  | BE, M.Tech          | 9823935753 |
| 47 | Mr. Dilip Budhlani (EM)     | 02/07/2007 | Asst. Professor | 17 yrs  | BE, M.Tech          | 9765325495 |
| 48 | Dr. Roshani Halmore (Chem.) | 01/09/2011 | Asst. Professor | 12 yrs  | B.Sc, M.Sc, Ph.D    | 9823380178 |
| 49 | Ms. Ekta Meshram (Chem.)    | 06/08/2007 | Asst. Professor | 13 yrs  | B.Sc, M.Sc, M.Phil  | 9764093405 |

|    |                              |            |                 |          |                     |            |
|----|------------------------------|------------|-----------------|----------|---------------------|------------|
| 50 | Mr. Sandeep Bhongade (Maths) | 03/10/2021 | Asst. Professor | 8 yrs    | B.Sc., M. Sc., B.Ed | 9657608895 |
| 51 | Ms. Aparna Kelkar (Comm.)    | 01/12/2018 | Asst. Professor | 4 yrs    | B.Sc, MSW           | 9156731161 |
| 52 | Mr. Maroti Alat (Eco)        | 01/04/2016 | Asst. Professor | 3 yrs    | BCA, MBA            | 8554986470 |
| 53 | Ms. Sanjivini Barde (EE)     | 22/01/2018 | Asst. Professor | 3 yrs    | BE, M.Tech          | 8208212273 |
| 54 | Ms. Manmeet Kaur Dhall (Eco) | 15/05/2011 | Asst. Professor | 10 yrs   | MA, MBA             | 8796076599 |
| 55 | Ms. Vishakha Purohit         | 03/10/2013 | Asst. Professor | 2 yrs    | BCCA, MBA           | 9372717970 |
| 56 | Ms. Meghna Suryawanshi       | 01/12/2012 | Asst. Professor | 9 yrs    | B.Sc, M.Sc          | 9823707350 |
| 57 | Mr. Swapnil Charjan          | 01/03/2022 | Asst. Professor | 4 yrs    | B.Sc, M.Sc          | 8857003523 |
| 58 | Ms. Suharshana S Somkuwar    | 14/02/2022 | Asst. Professor | 1 yr     | B.Sc, M.Sc          | 8308933913 |
| 59 | Dr. Jonathan S. Joseph       | 17/08/2021 | Asst. Professor | 9 yrs    | M.Com, MBA, Ph.D    | 9665810350 |
| 60 | Mr. Kunal Padole             | 12/05/2021 | Asst. Professor | 8 yrs    | MBA                 | 9823260303 |
| 61 | Dr. Jaspal Gidwani           | 05/07/2012 | Asst. Professor | 9 yrs    | B.Com, MBA, Ph.D    | 9766285304 |
| 62 | Dr. Pravin Bhise             | 25/06/2012 | Asst. Professor | 13 yrs   | B.Sc, MBA, Ph.D     | 9766304066 |
| 63 | Mr. Rajendra Katole          | 15/07/2009 | Asst. Professor | 12 yrs   | BA, MBA             | 9970243646 |
| 64 | Ms. Vinita Dighorikar        | 22/11/2018 | Asst. Professor | 3 yrs    | B.Sc, MBA, Ph.D     | 9579042488 |
| 65 | Ms. Ashima Varghese          | 12/01/2021 | Asst. Professor | 23.5 yrs | MBA                 | 9823047599 |
| 66 | Ms. Shweta Wasnik            | 22/07/2021 | Asst. Professor | 1 yr     | MBA                 | 7709966991 |
| 67 | Ms. Pallavi Chaple           | 07/12/2018 | Asst. Professor | 3 yrs    | B.Tech, MBA         | 8793336142 |
| 68 | Ms. Pooja K Nagpure          | 24/01/2022 | Asst. Professor | 2 yrs    | B.E. MBA            | 9356649705 |

|  |   |                                      |                        |   |  |  |
|--|---|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Dr. Hemant Hajare   |                                      |                        |  |  |  |
| Designation                                | Principal   |                                      |                        |   |  |  |
| Date of Joining the Institute              | 03-Jan-2022   |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class)   | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>Civil   |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>25 yrs   | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>3  | <b>International</b><br>9            |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>4  | <b>International</b><br>11           |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -   |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | 1. Various projects at undergraduate and postgraduate as well as Ph.D. level are carried out.<br>2. Applied for Finance Assistance SERB and Department of Science & Technology, India for the research work titled.<br>a) GIS application for the assessment of Crop water requirement.<br>b) Critical analysis of seepage using Ferro-cement canal lining. |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -   |                                      |                        |   |  |  |
| Professional Memberships                   | -   |                                      |                        |   |  |  |
| Consultancy Activities                     | -   |                                      |                        |   |  |  |
| Awards                                     | -   |                                      |                        |   |  |  |
| Grants fetch                               | -   |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -   |                                      |                        |   |  |  |

## FACULTY BIODATA

### Department of Computer Science & Engineering

|  |                                   |                                      |                            |   |  |
|--|-----------------------------------|--------------------------------------|----------------------------|---|--|
| Name of Teaching Staff                     | Mr. Ayaz Khan                     |                                      |                            |  |  |
| Designation                                | Assistant Professor               |                                      |                            |   |  |
| Department                                 | Computer Science & Engineering    |                                      |                            |   |  |
| Date of Joining the Institute              | 16-June-2009                      |                                      |                            |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil     |   |  |
| Paper Published                            | <b>National</b><br>Nil            |                                      | <b>International</b><br>03 |   |  |
| Paper Presented in Conferences             | <b>National</b><br>01             |                                      | <b>International</b><br>02 |   |  |
| Ph.D Guidance? Give field and University   | -                                 |                                      |                            |   |  |
| Ph.D/ Project Guided                       | -                                 |                                      |                            |   |  |
| Books Published / IPRS/ Patents            | -                                 |                                      |                            |   |  |
| Professional Memberships                   | -                                 |                                      |                            |   |  |
| Consultancy Activities                     | -                                 |                                      |                            |   |  |
| Awards                                     | -                                 |                                      |                            |   |  |
| Grants fetch                               | -                                 |                                      |                            |   |  |
| Interaction with Professional Institutions | -                                 |                                      |                            |   |  |

|  |                                   |                                      |                             |   |  |  |
|--|-----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Ankita Gaware                 |                                      |                             |  |  |  |
| Designation                                | Assistant Professor               |                                      |                             |   |  |  |
| Department                                 | Computer Science & Engineering    |                                      |                             |   |  |  |
| Date of Joining the Institute              | 14-December-2018                  |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.5 yr         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil            |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil            |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                 |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                 |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                 |                                      |                             |   |  |  |
| Professional Memberships                   | -                                 |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                 |                                      |                             |   |  |  |
| Awards                                     | -                                 |                                      |                             |   |  |  |
| Grants fetch                               | -                                 |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                 |                                      |                             |   |  |  |

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|--|----------------------------------|-----------------------------------|------------------------|---|--|--|--|
| Name of Teaching Staff                     | Ms. Minal Ukinkar                |                                   |                        |  |  |  |  |
| Designation                                | Assistant Professor              |                                   |                        |   |  |  |  |
| Department                                 | Computer Science & Engineering   |                                   |                        |   |  |  |  |
| Date of Joining the Institute              | 20-June-2013                     |                                   |                        |   |  |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.E<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.8 yr        | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |   |  |  |  |
| Paper Published                            | <b>National</b><br>01            | <b>International</b><br>Nil       |                        |   |  |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>01        |                        |   |  |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                   |                        |   |  |  |  |
| Ph.D/ Project Guided                       | -                                |                                   |                        |   |  |  |  |
| Books Published / IPRS/ Patents            | -                                |                                   |                        |   |  |  |  |
| Professional Memberships                   | -                                |                                   |                        |   |  |  |  |
| Consultancy Activities                     | -                                |                                   |                        |   |  |  |  |
| Awards                                     | -                                |                                   |                        |   |  |  |  |
| Grants fetch                               | -                                |                                   |                        |   |  |  |  |
| Interaction with Professional Institutions | -                                |                                   |                        |   |  |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Tejaswi Amte                 |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Computer Science & Engineering   |                                      |                        |   |  |  |
| Date of Joining the Institute              | 28-January-2019                  |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>1.5 yr        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Pranjali Padole              |                                      |                             |  |  |  |
| Designation                                | Assistant Professor              |                                      |                             |   |  |  |
| Department                                 | Computer Science & Engineering   |                                      |                             |   |  |  |
| Date of Joining the Institute              | 12-May-2021                      |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.2 yr        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |   |  |  |
| Professional Memberships                   | -                                |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                |                                      |                             |   |  |  |
| Awards                                     | -                                |                                      |                             |   |  |  |
| Grants fetch                               | -                                |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                             |   |  |  |

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Buddheshwar Borkar           |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Computer Science & Engineering   |                                      |                        |   |  |  |
| Date of Joining the Institute              | 28-Mar-2022                      |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>06 Month      | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                  |                                      |                             |   |  |  |
|--|----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Shubhangi Ghadinkar          |                                      |                             |  |  |  |
| Designation                                | Assistant Professor              |                                      |                             |   |  |  |
| Department                                 | Computer Science & Engineering   |                                      |                             |   |  |  |
| Date of Joining the Institute              | 03-Feb-2022                      |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.1 yr        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |   |  |  |
| Professional Memberships                   | -                                |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                |                                      |                             |   |  |  |
| Awards                                     | -                                |                                      |                             |   |  |  |
| Grants fetch                               | -                                |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                             |   |  |  |

|  |                                  |                                      |                             |
|--|----------------------------------|--------------------------------------|-----------------------------|
| Name of Teaching Staff                     | Ms. Shweta Ramteke               |                                      |                             |
| Designation                                | Assistant Professor              |                                      |                             |
| Department                                 | Computer Science & Engineering   |                                      |                             |
| Date of Joining the Institute              | 18-April-2022                    |                                      |                             |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |
| Total Experience in Years                  | <b>Teaching</b><br>0.1 yr        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |
| Ph.D/ Project Guided                       | -                                |                                      |                             |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |
| Professional Memberships                   | -                                |                                      |                             |
| Consultancy Activities                     | -                                |                                      |                             |
| Awards                                     | -                                |                                      |                             |
| Grants fetch                               | -                                |                                      |                             |
| Interaction with Professional Institutions | -                                |                                      |                             |



**Department of M. Tech-Computer Science & Engineering**

|  |  |                                      |                            |   |  |
|--|--|--------------------------------------|----------------------------|---|--|
| Name of Teaching Staff                     | Ms. Kalpana Malpe                              |                                      |                            |  |  |
| Designation                                | Assistant Professor                            |                                      |                            |   |  |
| Department                                 | <b>M. Tech-</b> Computer Science & Engineering |                                      |                            |   |  |
| Date of Joining the Institute              | 01-July-2008                                   |                                      |                            |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class)              | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs                      | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil     |   |  |
| Paper Published                            | <b>National</b><br>Nil                         |                                      | <b>International</b><br>17 |   |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil                         |                                      | <b>International</b><br>03 |   |  |
| Ph.D Guidance? Give field and University   | -  |                                      |                            |   |  |
| Ph.D/ Project Guided                       | -  |                                      |                            |   |  |
| Books Published / IPRS/ Patents            | -  |                                      |                            |   |  |
| Professional Memberships                   | -  |                                      |                            |   |  |
| Consultancy Activities                     | -  |                                      |                            |   |  |
| Awards                                     | -  |                                      |                            |   |  |
| Grants fetch                               | -  |                                      |                            |   |  |
| Interaction with Professional Institutions | -  |                                      |                            |   |  |

|  |  |                                       |                             |   |  |  |
|--|--|---------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Vijaya Kamble                              |                                       |                             |  |  |  |
| Designation                                | Assistant Professor                            |                                       |                             |   |  |  |
| Department                                 | <b>M. Tech-</b> Computer Science & Engineering |                                       |                             |   |  |  |
| Date of Joining the Institute              | 01-July-2008                                   |                                       |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class)              | <b>PG</b><br>M. Tech<br>(First Class) | <b>Ph. D</b><br>-           |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>15 yrs                      | <b>Industry</b><br>1 yr               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>03                          |                                       | <b>International</b><br>10  |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>03                          |                                       | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -  |                                       |                             |   |  |  |
| Ph.D/ Project Guided                       | -  |                                       |                             |   |  |  |
| Books Published / IPRS/ Patents            | -  |                                       |                             |   |  |  |
| Professional Memberships                   | -  |                                       |                             |   |  |  |
| Consultancy Activities                     | -  |                                       |                             |   |  |  |
| Awards                                     | -  |                                       |                             |   |  |  |
| Grants fetch                               | -  |                                       |                             |   |  |  |
| Interaction with Professional Institutions | -  |                                       |                             |   |  |  |

|  |  |                                      |                             |   |  |  |
|--|--|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Yogesh Wankar                              |                                      |                             |  |  |  |
| Designation                                | Assistant Professor                            |                                      |                             |   |  |  |
| Department                                 | <b>M. Tech-</b> Computer Science & Engineering |                                      |                             |   |  |  |
| Date of Joining the Institute              | 11-April-2016                                  |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BSC (cs)<br>(First Class)         | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.4 yr                      | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil                         |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil                         |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -  |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -  |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -  |                                      |                             |   |  |  |
| Professional Memberships                   | -  |                                      |                             |   |  |  |
| Consultancy Activities                     | -  |                                      |                             |   |  |  |
| Awards                                     | -  |                                      |                             |   |  |  |
| Grants fetch                               | -  |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -  |                                      |                             |   |  |  |

## Department of Electrical Engineering

|  |                                  |                                       |                        |  |  |
|--|----------------------------------|---------------------------------------|------------------------|--|--|
| Name of Teaching Staff                     | Mr. Rajendra Bhombe              |                                       |                        |  |  |
| Designation                                | Assistant Professor              |                                       |                        |  |  |
| Department                                 | Electrical Engineering           |                                       |                        |  |  |
| Date of Joining the Institute              | 01-October-2007                  |                                       |                        |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M. Tech<br>(First Class) | <b>Ph. D</b><br>-      |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>15 yrs        | <b>Industry</b><br>Nil                | <b>Research</b><br>Nil |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>05            |                        |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>02            |                        |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                       |                        |  |  |
| Ph.D/ Project Guided                       | -                                |                                       |                        |  |  |
| Books Published / IPRS/ Patents            | -                                |                                       |                        |  |  |
| Professional Memberships                   | ISTE                             |                                       |                        |  |  |
| Consultancy Activities                     | -                                |                                       |                        |  |  |
| Awards                                     | -                                |                                       |                        |  |  |
| Grants fetch                               | -                                |                                       |                        |  |  |
| Interaction with Professional Institutions | -                                |                                       |                        |  |  |



|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Pradeep Barde                |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |
| Date of Joining the Institute              | 01-June-2012                     |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>15 yrs        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>01           |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|--|----------------------------------|-----------------------------|------------------------|--|--|--|--|
|  | Designation                                | Assistant Professor              |                             |                        |  |  |  |  |
|  | Department                                 | Electrical Engineering           |                             |                        |  |  |  |  |
|  | Date of Joining the Institute              | 15-Nov-2013                      |                             |                        |  |  |  |  |
|  | Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>-              | <b>Ph.D</b><br>-       |  |  |  |  |
|  | Total Experience in Years                  | <b>Teaching</b><br>2 yrs         | <b>Industry</b><br>Nil      | <b>Research</b><br>Nil |  |  |  |  |
|  | Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |  |  |  |  |
|  | Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |  |  |  |  |
|  | Ph.D Guidance? Give field and University   | -                                |                             |                        |  |  |  |  |
|  | Ph.D/ Project Guided                       | -                                |                             |                        |  |  |  |  |
|  | Books Published / IPRS/ Patents            | -                                |                             |                        |  |  |  |  |
|  | Professional Memberships                   | -                                |                             |                        |  |  |  |  |
|  | Consultancy Activities                     | -                                |                             |                        |  |  |  |  |
|  | Awards                                     | -                                |                             |                        |  |  |  |  |
|  | Grants fetch                               | -                                |                             |                        |  |  |  |  |
|  | Interaction with Professional Institutions | -                                |                             |                        |  |  |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Saraswati Mishra             |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |
| Date of Joining the Institute              | 24-April-2015                    |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>1 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Yogesh Gajbhiye              |                                      |                             |  |  |  |
| Designation                                | Assistant Professor              |                                      |                             |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                             |   |  |  |
| Date of Joining the Institute              | 21-Dec-2015                      |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>4.5 yrs       | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>02            |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |   |  |  |
| Professional Memberships                   | -                                |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                |                                      |                             |   |  |  |
| Awards                                     | -                                |                                      |                             |   |  |  |
| Grants fetch                               | -                                |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                             |   |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Sneha Masarkar               |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |
| Date of Joining the Institute              | 28-July-2016                     |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>4 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>02           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Syeda Saba                   |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |
| Date of Joining the Institute              | 17-Jan-2018                      |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>6 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>02            | <b>International</b><br>02           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|-----------------------------|
| Name of Teaching Staff                     | Mr. Akshay Pillewan              |                                      |                             |
| Designation                                | Assistant Professor              |                                      |                             |
| Department                                 | Electrical Engineering           |                                      |                             |
| Date of Joining the Institute              | 17-July-2017                     |                                      |                             |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |
| Total Experience in Years                  | <b>Teaching</b><br>4 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>04  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |
| Ph.D/ Project Guided                       | -                                |                                      |                             |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |
| Professional Memberships                   | -                                |                                      |                             |
| Consultancy Activities                     | -                                |                                      |                             |
| Awards                                     | -                                |                                      |                             |
| Grants fetch                               | -                                |                                      |                             |
| Interaction with Professional Institutions | -                                |                                      |                             |



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|--|----------------------------------|-----------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Kavita Patil                 |                                   |                        |  |  |  |
| Designation                                | Assistant Professor              |                                   |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                   |                        |   |  |  |
| Date of Joining the Institute              | 01-March-2017                    |                                   |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BA<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>2 yrs         | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil       |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil       |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                   |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                   |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                   |                        |   |  |  |
| Professional Memberships                   | -                                |                                   |                        |   |  |  |
| Consultancy Activities                     | -                                |                                   |                        |   |  |  |
| Awards                                     | -                                |                                   |                        |   |  |  |
| Grants fetch                               | -                                |                                   |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                   |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Rutuja Zade                  |                                      |                             |  |  |  |
| Designation                                | Assistant Professor              |                                      |                             |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                             |   |  |  |
| Date of Joining the Institute              | 11-January-2019                  |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>Nil           | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |   |  |  |
| Professional Memberships                   | -                                |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                |                                      |                             |   |  |  |
| Awards                                     | -                                |                                      |                             |   |  |  |
| Grants fetch                               | -                                |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                             |   |  |  |

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|--|----------------------------------|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Milind Rode                  |                                      |                             |  |  |  |
| Designation                                | Assistant Professor              |                                      |                             |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                             |   |  |  |
| Date of Joining the Institute              | 20-May-2021                      |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>6 yr          | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02            |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                             |   |  |  |
| Professional Memberships                   | -                                |                                      |                             |   |  |  |
| Consultancy Activities                     | -                                |                                      |                             |   |  |  |
| Awards                                     | -                                |                                      |                             |   |  |  |
| Grants fetch                               | -                                |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                             |   |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|--|--|
| Name of Teaching Staff                     | Ms. Kanchan Bande                |                                      |                        |  |  |
| Designation                                | Assistant Professor              |                                      |                        |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |  |  |
| Date of Joining the Institute              | 23-July-2021                     |                                      |                        |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yr         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |  |  |
| Professional Memberships                   | -                                |                                      |                        |  |  |
| Consultancy Activities                     | -                                |                                      |                        |  |  |
| Awards                                     | -                                |                                      |                        |  |  |
| Grants fetch                               | -                                |                                      |                        |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |  |  |



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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Ankita Bhimgade              |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |
| Date of Joining the Institute              | 22-Nov-2021                      |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>01 yr         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

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|--|----------------------------------|--------------------------------------|------------------------|---|--|--|--|
| Name of Teaching Staff                     | Ms. Pallavi Barekar              |                                      |                        |  |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |  |
| Department                                 | Electrical Engineering           |                                      |                        |   |  |  |  |
| Date of Joining the Institute              | 01-Dec-2021                      |                                      |                        |   |  |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>01 yr         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |  |
| Paper Published                            | <b>National</b><br>01            | <b>International</b><br>Nil          |                        |   |  |  |  |
| Paper Presented in Conferences             | <b>National</b><br>01            | <b>International</b><br>Nil          |                        |   |  |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |  |

|  |   |                                      |                            |   |  |  |
|--|---|--------------------------------------|----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Manishkumar Agrawal   |                                      |                            |  |  |  |
| Designation                                | Assistant Professor   |                                      |                            |   |  |  |
| Department                                 | Electrical Engineering  |                                      |                            |   |  |  |
| Date of Joining the Institute              | 01-June-2021  |                                      |                            |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class)  | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>06 yr  | <b>Industry</b><br>05                | <b>Research</b><br>Nil     |   |  |  |
| Paper Published                            | <b>National</b><br>04   |                                      | <b>International</b><br>02 |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil  |                                      | <b>International</b><br>02 |   |  |  |
| Ph.D Guidance? Give field and University   | -   |                                      |                            |   |  |  |
| Ph.D/ Project Guided                       | -   |                                      |                            |   |  |  |
| Books Published / IPRS/ Patents            | -   |                                      |                            |   |  |  |
| Professional Memberships                   | -   |                                      |                            |   |  |  |
| Consultancy Activities                     | -   |                                      |                            |   |  |  |
| Awards                                     | -   |                                      |                            |   |  |  |
| Grants fetch                               | -   |                                      |                            |   |  |  |
| Interaction with Professional Institutions | -As a expert lecture at VNIET College Nagpur, As a expert lecture at RGCER, As a chief guest in project competition JD COE. |                                      |                            |   |  |  |

## Department of Power Electronics & Power System

|  |   |                                      |                             |   |  |  |
|--|---|--------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Hitesh Murkute                              |                                      |                             |  |  |  |
| Designation                                | Assistant Professor                             |                                      |                             |   |  |  |
| Department                                 | <b>M.Tech-</b> Power Electronics & Power System |                                      |                             |   |  |  |
| Date of Joining the Institute              | 12-May-2015                                     |                                      |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class)                | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs                       | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>03                           |                                      | <b>International</b><br>06  |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>05                           |                                      | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -   |                                      |                             |   |  |  |
| Ph.D/ Project Guided                       | -   |                                      |                             |   |  |  |
| Books Published / IPRS/ Patents            | -   |                                      |                             |   |  |  |
| Professional Memberships                   | -   |                                      |                             |   |  |  |
| Consultancy Activities                     | -   |                                      |                             |   |  |  |
| Awards                                     | -   |                                      |                             |   |  |  |
| Grants fetch                               | -   |                                      |                             |   |  |  |
| Interaction with Professional Institutions | -   |                                      |                             |   |  |  |

|  |   |                                      |                            |   |  |  |
|--|---|--------------------------------------|----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Diksha Khare                                |                                      |                            |  |  |  |
| Designation                                | Assistant Professor                             |                                      |                            |   |  |  |
| Department                                 | <b>M.Tech-</b> Power Electronics & Power System |                                      |                            |   |  |  |
| Date of Joining the Institute              | 01-July-2015                                    |                                      |                            |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class)                | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>9 yrs                        | <b>Industry</b><br>Nil               | <b>Research</b><br>1.5 yrs |   |  |  |
| Paper Published                            | <b>National</b><br>Nil                          |                                      | <b>International</b><br>02 |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>01                           |                                      | <b>International</b><br>02 |   |  |  |
| Ph.D Guidance? Give field and University   | -   |                                      |                            |   |  |  |
| Ph.D/ Project Guided                       | -   |                                      |                            |   |  |  |
| Books Published / IPRS/ Patents            | -   |                                      |                            |   |  |  |
| Professional Memberships                   | -   |                                      |                            |   |  |  |
| Consultancy Activities                     | -   |                                      |                            |   |  |  |
| Awards                                     | -   |                                      |                            |   |  |  |
| Grants fetch                               | -   |                                      |                            |   |  |  |
| Interaction with Professional Institutions | -   |                                      |                            |   |  |  |

|  |   |                                      |                                 |
|--|---|--------------------------------------|---------------------------------|
| Name of Teaching Staff                     | Mr. Yogesh Likhar                               |                                      |                                 |
| Designation                                | Assistant Professor                             |                                      |                                 |
| Department                                 | <b>M.Tech-</b> Power Electronics & Power System |                                      |                                 |
| Date of Joining the Institute              | 02-July-2018                                    |                                      |                                 |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class)                | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-                |
| Total Experience in Years                  | <b>Teaching</b><br><br>3 yrs                    | <b>Industry</b><br><br>Nil           | <b>Research</b><br><br>Nil      |
| Paper Published                            | <b>National</b><br><br>02                       |                                      | <b>International</b><br><br>02  |
| Paper Presented in Conferences             | <b>National</b><br><br>02                       |                                      | <b>International</b><br><br>Nil |
| Ph.D Guidance? Give field and University   | -   |                                      |                                 |
| Ph.D/ Project Guided                       | -   |                                      |                                 |
| Books Published / IPRS/ Patents            | -   |                                      |                                 |
| Professional Memberships                   | -   |                                      |                                 |
| Consultancy Activities                     | -   |                                      |                                 |
| Awards                                     | -   |                                      |                                 |
| Grants fetch                               | -   |                                      |                                 |
| Interaction with Professional Institutions | -   |                                      |                                 |



## Department Of Electronics & Telecommunication

|  |                                  |                                      |                        |   |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Mr. Amar Banmare                 |                                      |                        |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |
| Date of Joining the Institute              | 21-May-2011                      |                                      |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs        | <b>Industry</b><br>04 yrs            | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>01            | <b>International</b><br>01           |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>01           |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |
| Awards                                     | -                                |                                      |                        |   |  |
| Grants fetch                               | -                                |                                      |                        |   |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |

|  |                                  |                                      |                            |   |  |  |
|--|----------------------------------|--------------------------------------|----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Sushma Telrandhe             |                                      |                            |  |  |  |
| Designation                                | Assistant Professor              |                                      |                            |   |  |  |
| Department                                 | Electronics & Telecommunication  |                                      |                            |   |  |  |
| Date of Joining the Institute              | 31-May-2010                      |                                      |                            |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>5.8 yrs       | <b>Industry</b><br>04 yrs            | <b>Research</b><br>Nil     |   |  |  |
| Paper Published                            | <b>National</b><br>01            |                                      | <b>International</b><br>01 |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>04            |                                      | <b>International</b><br>03 |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                            |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                            |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                            |   |  |  |
| Professional Memberships                   | -                                |                                      |                            |   |  |  |
| Consultancy Activities                     | -                                |                                      |                            |   |  |  |
| Awards                                     | -                                |                                      |                            |   |  |  |
| Grants fetch                               | -                                |                                      |                            |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                            |   |  |  |

|  |                                  |                                      |                        |   |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Mr. Deepak Deshpande             |                                      |                        |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |
| Date of Joining the Institute              | 20-May-2015                      |                                      |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>14 yrs        | <b>Industry</b><br>04 yrs            | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>04            | <b>International</b><br>02           |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>01           |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |
| Awards                                     | -                                |                                      |                        |   |  |
| Grants fetch                               | -                                |                                      |                        |   |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Suvarna Talatule             |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |  |
| Date of Joining the Institute              | 05-June-2014                     |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>04 yrs        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>0             | <b>International</b><br>01           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02            | <b>International</b><br>02           |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Abhay Satmohankar            |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |  |
| Date of Joining the Institute              | 15-September-2017                |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>09 yrs        | <b>Industry</b><br>01 yr             | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>0             | <b>International</b><br>01           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>0             | <b>International</b><br>06           |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                  |                                      |                        |   |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Ms. Sharon Bhatnagar             |                                      |                        |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |
| Date of Joining the Institute              | 01-July-2016                     |                                      |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>09 yrs        | <b>Industry</b><br>01 yr             | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>0             | <b>International</b><br>02           |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>0             | <b>International</b><br>02           |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |
| Awards                                     | -                                |                                      |                        |   |  |
| Grants fetch                               | -                                |                                      |                        |   |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |

|  |                                   |                                      |                        |  |  |
|--|-----------------------------------|--------------------------------------|------------------------|--|--|
| Name of Teaching Staff                     | Ms. Nayan Shambharkar             |                                      |                        |  |  |
| Designation                                | Assistant Professor               |                                      |                        |  |  |
| Department                                 | Electronics & Telecommunication   |                                      |                        |  |  |
| Date of Joining the Institute              | 01-July-2016                      |                                      |                        |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>7.5 yrs        | <b>Industry</b><br>1 yr              | <b>Research</b><br>Nil |  |  |
| Paper Published                            | <b>National</b><br>03             | <b>International</b><br>03           |                        |  |  |
| Paper Presented in Conferences             | <b>National</b><br>01             | <b>International</b><br>01           |                        |  |  |
| Ph.D Guidance? Give field and University   | -                                 |                                      |                        |  |  |
| Ph.D/ Project Guided                       | -                                 |                                      |                        |  |  |
| Books Published / IPRS/<br>Patents         | -                                 |                                      |                        |  |  |
| Professional Memberships                   | -                                 |                                      |                        |  |  |
| Consultancy Activities                     | -                                 |                                      |                        |  |  |
| Awards                                     | -                                 |                                      |                        |  |  |
| Grants fetch                               | -                                 |                                      |                        |  |  |
| Interaction with Professional Institutions | -                                 |                                      |                        |  |  |



|  |                                  |                                      |                            |
|--|----------------------------------|--------------------------------------|----------------------------|
| Name of Teaching Staff                     | Ms. Vrushali Ailwar              |                                      |                            |
| Designation                                | Assistant Professor              |                                      |                            |
| Department                                 | Electronics & Telecommunication  |                                      |                            |
| Date of Joining the Institute              | 15-November-2018                 |                                      |                            |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-           |
| Total Experience in Years                  | <b>Teaching</b><br>09 yrs        | <b>Industry</b><br>01 yr             | <b>Research</b><br>Nil     |
| Paper Published                            | <b>National</b><br>Nil           |                                      | <b>International</b><br>02 |
| Paper Presented in Conferences             | <b>National</b><br>Nil           |                                      | <b>International</b><br>02 |
| Ph.D Guidance? Give field and University   | -                                |                                      |                            |
| Ph.D/ Project Guided                       | -                                |                                      |                            |
| Books Published / IPRS/ Patents            | -                                |                                      |                            |
| Professional Memberships                   | -                                |                                      |                            |
| Consultancy Activities                     | -                                |                                      |                            |
| Awards                                     | -                                |                                      |                            |
| Grants fetch                               | -                                |                                      |                            |
| Interaction with Professional Institutions | -                                |                                      |                            |



|  |                                  |                                      |                        |   |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Mr. Yashwant Deodhe              |                                      |                        |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |
| Date of Joining the Institute              | 05-Sept-2021                     |                                      |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>19 yrs        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>05            | <b>International</b><br>07           |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>01            | <b>International</b><br>0            |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |
| Awards                                     | -                                |                                      |                        |   |  |
| Grants fetch                               | -                                |                                      |                        |   |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |

|  |                                 |                             |                            |  |  |
|--|---------------------------------|-----------------------------|----------------------------|--|--|
| Name of Teaching Staff                     | Prof. Nilesh A. Mohota          |                             |                            |  |  |
| Designation                                | Assistant Professor             |                             |                            |  |  |
| Department                                 | Electronics & Telecommunication |                             |                            |  |  |
| Date of Joining the Institute              | April 1 <sup>st</sup> , 2022    |                             |                            |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>First / 60%        | <b>PG</b><br>First / 68%    | <b>Ph.D</b><br>NA          |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>16 Years     | <b>Industry</b><br>6 Months | <b>Research</b><br>6 Years |  |  |
| Paper Published                            | <b>National</b><br>NA           | <b>International</b><br>15  |                            |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02           | <b>International</b><br>02  |                            |  |  |
| Ph.D Guidance? Give field and University   | NA                              |                             |                            |  |  |
| Ph.D/ Project Guided                       | NA                              |                             |                            |  |  |
| Books Published / IPRS/ Patents            | NA                              |                             |                            |  |  |
| Professional Memberships                   | ISTE                            |                             |                            |  |  |
| Consultancy Activities                     | NA                              |                             |                            |  |  |
| Awards                                     | NA                              |                             |                            |  |  |
| Grants fetch                               | NA                              |                             |                            |  |  |
| Interaction with Professional Institutions | ISTE, IETE                      |                             |                            |  |  |



|  |                                  |                             |                        |   |  |
|--|----------------------------------|-----------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Ms. Meher Lalwani                |                             |                        |  |  |
| Designation                                | Assistant Professor              |                             |                        |   |  |
| Department                                 | Electronics & Telecommunication  |                             |                        |   |  |
| Date of Joining the Institute              | 16-July-2021                     |                             |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>-              | <b>Ph.D</b><br>-       |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>04 yrs        | <b>Industry</b><br>Nil      | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                             |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                             |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                             |                        |   |  |
| Professional Memberships                   | -                                |                             |                        |   |  |
| Consultancy Activities                     | -                                |                             |                        |   |  |
| Awards                                     | -                                |                             |                        |   |  |
| Grants fetch                               | -                                |                             |                        |   |  |
| Interaction with Professional Institutions | -                                |                             |                        |   |  |

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Harna Bodele                 |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | Electronics & Telecommunication  |                                      |                        |   |  |  |
| Date of Joining the Institute              | 24-Jan-2022                      |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>3             | <b>International</b><br>Nil          |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>1            |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                  |                             |                        |  |  |
|--|----------------------------------|-----------------------------|------------------------|--|--|
| Name of Teaching Staff                     | Ms. Akansha Kale                 |                             |                        |  |  |
| Designation                                | Assistant Professor              |                             |                        |  |  |
| Department                                 | Electronics & Telecommunication  |                             |                        |  |  |
| Date of Joining the Institute              | 21-Feb-2022                      |                             |                        |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>-              | <b>Ph.D</b><br>-       |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.2 yr        | <b>Industry</b><br>Nil      | <b>Research</b><br>Nil |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil |                        |  |  |
| Ph.D Guidance? Give field and University   | -                                |                             |                        |  |  |
| Ph.D/ Project Guided                       | -                                |                             |                        |  |  |
| Books Published / IPRS/ Patents            | -                                |                             |                        |  |  |
| Professional Memberships                   | -                                |                             |                        |  |  |
| Consultancy Activities                     | -                                |                             |                        |  |  |
| Awards                                     | -                                |                             |                        |  |  |
| Grants fetch                               | -                                |                             |                        |  |  |
| Interaction with Professional Institutions | -                                |                             |                        |  |  |



### **Department of First Year**

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Kishor Wagh                  |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | First Year                       |                                      |                        |   |  |  |
| Date of Joining the Institute              | 15-June-2009                     |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>15 yrs        | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>08           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>01            | <b>International</b><br>04           |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                    |                                    |                             |   |  |  |
|--|------------------------------------|------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Ekta Meshram                   |                                    |                             |  |  |  |
| Designation                                | Assistant Professor                |                                    |                             |   |  |  |
| Department                                 | First Year                         |                                    |                             |   |  |  |
| Date of Joining the Institute              | 06-August-2007                     |                                    |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc<br>(First Class) | <b>Ph.D</b><br>Submitted    |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>13 yrs          | <b>Industry</b><br>Nil             | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>03              |                                    | <b>International</b><br>04  |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             |                                    | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                    |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                    |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                    |                             |   |  |  |
| Professional Memberships                   | ISTE                               |                                    |                             |   |  |  |
| Consultancy Activities                     | -                                  |                                    |                             |   |  |  |
| Awards                                     | -                                  |                                    |                             |   |  |  |
| Grants fetch                               | -                                  |                                    |                             |   |  |  |
| Interaction with Professional Institutions | -                                  |                                    |                             |   |  |  |

|  |                                  |                                  |                        |   |  |
|--|----------------------------------|----------------------------------|------------------------|---|--|
| Name of Teaching Staff                     | Mr. Dilip Budhlani               |                                  |                        |  |  |
| Designation                                | Assistant Professor              |                                  |                        |   |  |
| Department                                 | First Year                       |                                  |                        |   |  |
| Date of Joining the Institute              | 02-July-2007                     |                                  |                        |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>ME<br>(First Class) | <b>Ph.D</b>            |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>20 yrs        | <b>Industry</b><br>Nil           | <b>Research</b><br>Nil |   |  |
| Paper Published                            | <b>National</b><br>Nil           | <b>International</b><br>14       |                        |   |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>02       |                        |   |  |
| Ph.D Guidance? Give field and University   | -                                |                                  |                        |   |  |
| Ph.D/ Project Guided                       | -                                |                                  |                        |   |  |
| Books Published / IPRS/ Patents            | -                                |                                  |                        |   |  |
| Professional Memberships                   | ISTE, IEEE                       |                                  |                        |   |  |
| Consultancy Activities                     | -                                |                                  |                        |   |  |
| Awards                                     | -                                |                                  |                        |   |  |
| Grants fetch                               | -                                |                                  |                        |   |  |
| Interaction with Professional Institutions | -                                |                                  |                        |   |  |

|  |                                    |                                    |                        |   |  |  |  |
|--|------------------------------------|------------------------------------|------------------------|---|--|--|--|
| Name of Teaching Staff                     | Ms. Meghna Suryawanshi             |                                    |                        |  |  |  |  |
| Designation                                | Assistant Professor                |                                    |                        |   |  |  |  |
| Department                                 | First Year                         |                                    |                        |   |  |  |  |
| Date of Joining the Institute              | 01-September-2009                  |                                    |                        |   |  |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc<br>(First Class) | <b>Ph.D</b>            |   |  |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs          | <b>Industry</b><br>Nil             | <b>Research</b><br>Nil |   |  |  |  |
| Paper Published                            | <b>National</b><br>Nil             | <b>International</b><br>Nil        |                        |   |  |  |  |
| Paper Presented in Conferences             | <b>National</b><br>01              | <b>International</b><br>01         |                        |   |  |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                    |                        |   |  |  |  |
| Ph.D/ Project Guided                       | -                                  |                                    |                        |   |  |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                    |                        |   |  |  |  |
| Professional Memberships                   | -                                  |                                    |                        |   |  |  |  |
| Consultancy Activities                     | -                                  |                                    |                        |   |  |  |  |
| Awards                                     | -                                  |                                    |                        |   |  |  |  |
| Grants fetch                               | -                                  |                                    |                        |   |  |  |  |
| Interaction with Professional Institutions | -                                  |                                    |                        |   |  |  |  |

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|--|------------------------------------|------------------------------------|--------------------------|---|--|--|
| Name of Teaching Staff                     | Dr. Roshani Halmare                |                                    |                          |  |  |  |
| Designation                                | Assistant Professor                |                                    |                          |   |  |  |
| Department                                 | First Year                         |                                    |                          |   |  |  |
| Date of Joining the Institute              | 02-May-2015                        |                                    |                          |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc<br>(First Class) | <b>Ph.D</b><br>Chemistry |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>9 yrs           | <b>Industry</b><br>Nil             | <b>Research</b><br>Nil   |   |  |  |
| Paper Published                            | <b>National</b><br>Nil             | <b>International</b><br>Nil        |                          |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             | <b>International</b><br>01         |                          |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                    |                          |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                    |                          |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                    |                          |   |  |  |
| Professional Memberships                   | -                                  |                                    |                          |   |  |  |
| Consultancy Activities                     | -                                  |                                    |                          |   |  |  |
| Awards                                     | -                                  |                                    |                          |   |  |  |
| Grants fetch                               | -                                  |                                    |                          |   |  |  |
| Interaction with Professional Institutions | -                                  |                                    |                          |   |  |  |

|  |                                  |                                      |                        |   |  |  |
|--|----------------------------------|--------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Sanjivani Barde              |                                      |                        |  |  |  |
| Designation                                | Assistant Professor              |                                      |                        |   |  |  |
| Department                                 | First Year                       |                                      |                        |   |  |  |
| Date of Joining the Institute              | 22-Jan-2018                      |                                      |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BE<br>(First Class) | <b>PG</b><br>M.Tech<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>1 yrs         | <b>Industry</b><br>Nil               | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>03            | <b>International</b><br>01           |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil           | <b>International</b><br>Nil          |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                |                                      |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                |                                      |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                |                                      |                        |   |  |  |
| Professional Memberships                   | -                                |                                      |                        |   |  |  |
| Consultancy Activities                     | -                                |                                      |                        |   |  |  |
| Awards                                     | -                                |                                      |                        |   |  |  |
| Grants fetch                               | -                                |                                      |                        |   |  |  |
| Interaction with Professional Institutions | -                                |                                      |                        |   |  |  |

|  |                                    |                                   |                             |
|--|------------------------------------|-----------------------------------|-----------------------------|
| Name of Teaching Staff                     | Ms. Manmeet Kaur                   |                                   |                             |
| Designation                                | Assistant Professor                |                                   |                             |
| Department                                 | First Year                         |                                   |                             |
| Date of Joining the Institute              | 05-December -2011                  |                                   |                             |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-            |
| Total Experience in Years                  | <b>Teaching</b><br>4 yrs           | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil      |
| Paper Published                            | <b>National</b><br>Nil             |                                   | <b>International</b><br>Nil |
| Paper Presented in Conferences             | <b>National</b><br>Nil             |                                   | <b>International</b><br>Nil |
| Ph.D Guidance? Give field and University   | -                                  |                                   |                             |
| Ph.D/ Project Guided                       | -                                  |                                   |                             |
| Books Published / IPRS/ Patents            | -                                  |                                   |                             |
| Professional Memberships                   | -                                  |                                   |                             |
| Consultancy Activities                     | -                                  |                                   |                             |
| Awards                                     | -                                  |                                   |                             |
| Grants fetch                               | -                                  |                                   |                             |
| Interaction with Professional Institutions | -                                  |                                   |                             |



|  |                                   |                                   |                        |   |  |  |
|--|-----------------------------------|-----------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Maroti Alat                   |                                   |                        |  |  |  |
| Designation                                | Assistant Professor               |                                   |                        |   |  |  |
| Department                                 | First Year                        |                                   |                        |   |  |  |
| Date of Joining the Institute              | 11-April -2016                    |                                   |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>BCA<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>4 yrs          | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil            | <b>International</b><br>Nil       |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil            | <b>International</b><br>Nil       |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                 |                                   |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                 |                                   |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                 |                                   |                        |   |  |  |
| Professional Memberships                   | -                                 |                                   |                        |   |  |  |
| Consultancy Activities                     | -                                 |                                   |                        |   |  |  |
| Awards                                     | -                                 |                                   |                        |   |  |  |
| Grants fetch                               | -                                 |                                   |                        |   |  |  |
| Interaction with Professional Institutions | -                                 |                                   |                        |   |  |  |

|  |                                    |                                    |                             |   |  |  |
|--|------------------------------------|------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Vivek Korde                    |                                    |                             |  |  |  |
| Designation                                | Assistant Professor                |                                    |                             |   |  |  |
| Department                                 | First Year                         |                                    |                             |   |  |  |
| Date of Joining the Institute              | 22-july-2021                       |                                    |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc<br>(First Class) | <b>Ph.D</b><br>(Physics)    |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.8 yr          | <b>Industry</b><br>Nil             | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>4               |                                    | <b>International</b><br>2   |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>12              |                                    | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                    |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                    |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                    |                             |   |  |  |
| Professional Memberships                   | -                                  |                                    |                             |   |  |  |
| Consultancy Activities                     | -                                  |                                    |                             |   |  |  |
| Awards                                     | -                                  |                                    |                             |   |  |  |
| Grants fetch                               | -                                  |                                    |                             |   |  |  |
| Interaction with Professional Institutions | -                                  |                                    |                             |   |  |  |

|  |                                    |  |                             |   |  |  |
|--|------------------------------------|--|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Sandeep Bhongade               |  |                             |  |  |  |
| Designation                                | Assistant Professor                |  |                             |   |  |  |
| Department                                 | First Year                         |  |                             |   |  |  |
| Date of Joining the Institute              | 03-Oct-2021                        |  |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc., B.Ed.<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.8 yr          | <b>Industry</b><br>Nil                     | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil             |  | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             |  | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |  |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                  |  |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |  |                             |   |  |  |
| Professional Memberships                   | -                                  |  |                             |   |  |  |
| Consultancy Activities                     | -                                  |  |                             |   |  |  |
| Awards                                     | -                                  |  |                             |   |  |  |
| Grants fetch                               | -                                  |  |                             |   |  |  |
| Interaction with Professional Institutions | -                                  |  |                             |   |  |  |

|  |                                    |                                     |                             |   |  |  |
|--|------------------------------------|-------------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Suharshana Somkuwar            |                                     |                             |  |  |  |
| Designation                                | Assistant Professor                |                                     |                             |   |  |  |
| Department                                 | First Year                         |                                     |                             |   |  |  |
| Date of Joining the Institute              | 14-Feb-2022                        |                                     |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc.<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.1 yr          | <b>Industry</b><br>Nil              | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil             |                                     | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             |                                     | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                     |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                     |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                     |                             |   |  |  |
| Professional Memberships                   | -                                  |                                     |                             |   |  |  |
| Consultancy Activities                     | -                                  |                                     |                             |   |  |  |
| Awards                                     | -                                  |                                     |                             |   |  |  |
| Grants fetch                               | -                                  |                                     |                             |   |  |  |
| Interaction with Professional Institutions | -                                  |                                     |                             |   |  |  |

|  |                                    |                                     |                        |   |  |  |
|--|------------------------------------|-------------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Swapnil Charjan                |                                     |                        |  |  |  |
| Designation                                | Assistant Professor                |                                     |                        |   |  |  |
| Department                                 | First Year                         |                                     |                        |   |  |  |
| Date of Joining the Institute              | 01-Mar-2022                        |                                     |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>M.Sc.<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.4 yr          | <b>Industry</b><br>Nil              | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil             | <b>International</b><br>Nil         |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             | <b>International</b><br>Nil         |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                     |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                     |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                     |                        |   |  |  |
| Professional Memberships                   | -                                  |                                     |                        |   |  |  |
| Consultancy Activities                     | -                                  |                                     |                        |   |  |  |
| Awards                                     | -                                  |                                     |                        |   |  |  |
| Grants fetch                               | -                                  |                                     |                        |   |  |  |
| Interaction with Professional Institutions | -                                  |                                     |                        |   |  |  |

**Department- Master of Business Administration**

|  |                                     |                                   |   |   |  |
|--|-------------------------------------|-----------------------------------|---|---|--|
| Name of Teaching Staff                     | Dr. Jaspal Gidwani                  |                                   |   |  |  |
| Designation                                | Assistant Professor                 |                                   |   |   |  |
| Department                                 | Master of Business Administration   |                                   |   |   |  |
| Date of Joining the Institute              | 05-July-2012                        |                                   |   |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Com<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>Business<br>Management<br>(FM) |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>10 yrs           | <b>Industry</b><br>02 yrs         | <b>Research</b><br>07 yrs                     |   |  |
| Paper Published                            | <b>National</b><br>02               | <b>International</b><br>02        |   |   |  |
| Paper Presented in Conferences             | <b>National</b><br>02               | <b>International</b><br>01        |   |   |  |
| Ph.D Guidance? Give field and University   | -                                   |                                   |   |   |  |
| Ph.D/ Project Guided                       | -                                   |                                   |   |   |  |
| Books Published / IPRS/ Patents            | -                                   |                                   |   |   |  |
| Professional Memberships                   | -                                   |                                   |   |   |  |
| Consultancy Activities                     | -                                   |                                   |   |   |  |
| Awards                                     | -                                   |                                   |   |   |  |
| Grants fetch                               | -                                   |                                   |   |   |  |
| Interaction with Professional Institutions | -                                   |                                   |   |   |  |

|  |                                    |                                   |                                    |   |  |
|--|------------------------------------|-----------------------------------|------------------------------------|---|--|
| Name of Teaching Staff                     | Dr. Pravin Bhise                   |                                   |                                    |  |  |
| Designation                                | Assistant Professor                |                                   |                                    |   |  |
| Department                                 | Master of Business Administration  |                                   |                                    |   |  |
| Date of Joining the Institute              | 21-June-2012                       |                                   |                                    |   |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>Management<br>(HRM) |   |  |
| Total Experience in Years                  | <b>Teaching</b><br>12 yrs          | <b>Industry</b><br>06 yrs         | <b>Research</b><br>05 yrs          |   |  |
| Paper Published                            | <b>National</b><br>24              | <b>International</b><br>08        |                                    |   |  |
| Paper Presented in Conferences             | <b>National</b><br>20              | <b>International</b><br>06        |                                    |   |  |
| Ph.D Guidance? Give field and University   | -                                  |                                   |                                    |   |  |
| Ph.D/ Project Guided                       | -                                  |                                   |                                    |   |  |
| Books Published / IPRS/ Patents            | 1                                  |                                   |                                    |   |  |
| Professional Memberships                   | -                                  |                                   |                                    |   |  |
| Consultancy Activities                     | -                                  |                                   |                                    |   |  |
| Awards                                     | -                                  |                                   |                                    |   |  |
| Grants fetch                               | -                                  |                                   |                                    |   |  |
| Interaction with Professional Institutions | -                                  |                                   |                                    |   |  |

|  |                                   |                                   |                            |   |  |  |
|--|-----------------------------------|-----------------------------------|----------------------------|---|--|--|
| Name of Teaching Staff                     | Mr. Rajendra Katole               |                                   |                            |  |  |  |
| Designation                                | Assistant Professor               |                                   |                            |   |  |  |
| Department                                 | Master of Business Administration |                                   |                            |   |  |  |
| Date of Joining the Institute              | 23-July-2009                      |                                   |                            |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.A<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-           |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>08 yrs         | <b>Industry</b><br>01 yrs         | <b>Research</b><br>06yrs   |   |  |  |
| Paper Published                            | <b>National</b><br>02             |                                   | <b>International</b><br>01 |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>02             |                                   | <b>International</b><br>01 |   |  |  |
| Ph.D Guidance? Give field and University   | -                                 |                                   |                            |   |  |  |
| Ph.D/ Project Guided                       | -                                 |                                   |                            |   |  |  |
| Books Published / IPRS/ Patents            | -                                 |                                   |                            |   |  |  |
| Professional Memberships                   | -                                 |                                   |                            |   |  |  |
| Consultancy Activities                     | -                                 |                                   |                            |   |  |  |
| Awards                                     | -                                 |                                   |                            |   |  |  |
| Grants fetch                               | -                                 |                                   |                            |   |  |  |
| Interaction with Professional Institutions | -                                 |                                   |                            |   |  |  |

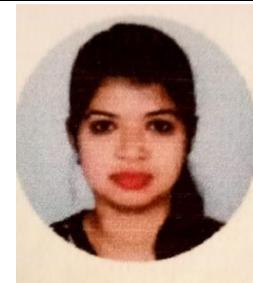
|  |                                    |                                   |                             |   |  |  |
|--|------------------------------------|-----------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Vinita Dighorikar              |                                   |                             |  |  |  |
| Designation                                | Assistant Professor                |                                   |                             |   |  |  |
| Department                                 | Master of Business Administration  |                                   |                             |   |  |  |
| Date of Joining the Institute              | 11-November-2018                   |                                   |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>Nil             | <b>Industry</b><br>02 yrs         | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil             |                                   | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             |                                   | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                   |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                   |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                   |                             |   |  |  |
| Professional Memberships                   | -                                  |                                   |                             |   |  |  |
| Consultancy Activities                     | -                                  |                                   |                             |   |  |  |
| Awards                                     | -                                  |                                   |                             |   |  |  |
| Grants fetch                               | -                                  |                                   |                             |   |  |  |
| Interaction with Professional Institutions | -                                  |                                   |                             |   |  |  |

|  |                                      |                                   |                             |   |  |  |
|--|--------------------------------------|-----------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Pallavi Chaple                   |                                   |                             |  |  |  |
| Designation                                | Assistant Professor                  |                                   |                             |   |  |  |
| Department                                 | Master of Business Administration    |                                   |                             |   |  |  |
| Date of Joining the Institute              | 07-December-2018                     |                                   |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Tech<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>Nil               | <b>Industry</b><br>03 yrs         | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil               |                                   | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil               |                                   | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                    |                                   |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                    |                                   |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                    |                                   |                             |   |  |  |
| Professional Memberships                   | -                                    |                                   |                             |   |  |  |
| Consultancy Activities                     | -                                    |                                   |                             |   |  |  |
| Awards                                     | -                                    |                                   |                             |   |  |  |
| Grants fetch                               | -                                    |                                   |                             |   |  |  |
| Interaction with Professional Institutions | -                                    |                                   |                             |   |  |  |

|  |                                     |                                   |                             |   |  |  |
|--|-------------------------------------|-----------------------------------|-----------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Ashima Varghese                 |                                   |                             |  |  |  |
| Designation                                | Assistant Professor                 |                                   |                             |   |  |  |
| Department                                 | Master of Business Administration   |                                   |                             |   |  |  |
| Date of Joining the Institute              | 12-Jan-2021                         |                                   |                             |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Sc.<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-            |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>23.5 Yrs.        | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil      |   |  |  |
| Paper Published                            | <b>National</b><br>Nil              |                                   | <b>International</b><br>Nil |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil              |                                   | <b>International</b><br>Nil |   |  |  |
| Ph.D Guidance? Give field and University   | -                                   |                                   |                             |   |  |  |
| Ph.D/ Project Guided                       | -                                   |                                   |                             |   |  |  |
| Books Published / IPRS/ Patents            | -                                   |                                   |                             |   |  |  |
| Professional Memberships                   | -                                   |                                   |                             |   |  |  |
| Consultancy Activities                     | -                                   |                                   |                             |   |  |  |
| Awards                                     | -                                   |                                   |                             |   |  |  |
| Grants fetch                               | -                                   |                                   |                             |   |  |  |
| Interaction with Professional Institutions | -                                   |                                   |                             |   |  |  |

|  |                                   |                                   |                        |   |  |  |
|--|-----------------------------------|-----------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Kunal Padole                  |                                   |                        |  |  |  |
| Designation                                | Assistant Professor               |                                   |                        |   |  |  |
| Department                                 | Master of Business Administration |                                   |                        |   |  |  |
| Date of Joining the Institute              | 12-May-2021                       |                                   |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>-                    | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.8 Yrs.       | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>Nil            | <b>International</b><br>Nil       |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil            | <b>International</b><br>Nil       |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                 |                                   |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                 |                                   |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                 |                                   |                        |   |  |  |
| Professional Memberships                   | -                                 |                                   |                        |   |  |  |
| Consultancy Activities                     | -                                 |                                   |                        |   |  |  |
| Awards                                     | -                                 |                                   |                        |   |  |  |
| Grants fetch                               | -                                 |                                   |                        |   |  |  |
| Interaction with Professional Institutions | -                                 |                                   |                        |   |  |  |

|  |                                    |                                   |                        |  |  |
|--|------------------------------------|-----------------------------------|------------------------|--|--|
| Name of Teaching Staff                     | Ms. Shweta Wasnik                  |                                   |                        |  |  |
| Designation                                | Assistant Professor                |                                   |                        |  |  |
| Department                                 | Master of Business Administration  |                                   |                        |  |  |
| Date of Joining the Institute              | 22-Jul-2021                        |                                   |                        |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E.<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-       |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.1 Yrs.        | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |  |  |
| Paper Published                            | <b>National</b><br>Nil             | <b>International</b><br>Nil       |                        |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             | <b>International</b><br>Nil       |                        |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                   |                        |  |  |
| Ph.D/ Project Guided                       | -                                  |                                   |                        |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                   |                        |  |  |
| Professional Memberships                   | -                                  |                                   |                        |  |  |
| Consultancy Activities                     | -                                  |                                   |                        |  |  |
| Awards                                     | -                                  |                                   |                        |  |  |
| Grants fetch                               | -                                  |                                   |                        |  |  |
| Interaction with Professional Institutions | -                                  |                                   |                        |  |  |



|  |                                      |   |                                      |  |  |
|--|--------------------------------------|---|--------------------------------------|--|--|
| Name of Teaching Staff                     | Ms. Jonathan Joseph                  |   |                                      |  |  |
| Designation                                | Assistant Professor                  |   |                                      |  |  |
| Department                                 | Master of Business Administration    |   |                                      |  |  |
| Date of Joining the Institute              | 17-Aug-2021                          |   |                                      |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.Com.<br>(First Class) | <b>PG</b><br>M.Com., MBA<br>(First Class) | <b>Ph.D</b><br>Commerce & Management |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.5 Yrs.          | <b>Industry</b><br>0.3 Yrs                | <b>Research</b><br>Nil               |  |  |
| Paper Published                            | <b>National</b><br>3                 | <b>International</b><br>10                |                                      |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil               | <b>International</b><br>Nil               |                                      |  |  |
| Ph.D Guidance? Give field and University   | -                                    |   |                                      |  |  |
| Ph.D/ Project Guided                       | -                                    |   |                                      |  |  |
| Books Published / IPRS/ Patents            | -                                    |   |                                      |  |  |
| Professional Memberships                   | -                                    |   |                                      |  |  |
| Consultancy Activities                     | -                                    |   |                                      |  |  |
| Awards                                     | -                                    |   |                                      |  |  |
| Grants fetch                               | -                                    |   |                                      |  |  |
| Interaction with Professional Institutions | -                                    |   |                                      |  |  |



|  |                                    |                                   |                        |   |  |  |
|--|------------------------------------|-----------------------------------|------------------------|---|--|--|
| Name of Teaching Staff                     | Ms. Puja Nagpure                   |                                   |                        |  |  |  |
| Designation                                | Assistant Professor                |                                   |                        |   |  |  |
| Department                                 | Master of Business Administration  |                                   |                        |   |  |  |
| Date of Joining the Institute              | 24-Jan-2022                        |                                   |                        |   |  |  |
| Qualification with Class/Grade             | <b>UG</b><br>B.E.<br>(First Class) | <b>PG</b><br>MBA<br>(First Class) | <b>Ph.D</b><br>-       |   |  |  |
| Total Experience in Years                  | <b>Teaching</b><br>0.2 Yrs.        | <b>Industry</b><br>Nil            | <b>Research</b><br>Nil |   |  |  |
| Paper Published                            | <b>National</b><br>3               | <b>International</b><br>10        |                        |   |  |  |
| Paper Presented in Conferences             | <b>National</b><br>Nil             | <b>International</b><br>Nil       |                        |   |  |  |
| Ph.D Guidance? Give field and University   | -                                  |                                   |                        |   |  |  |
| Ph.D/ Project Guided                       | -                                  |                                   |                        |   |  |  |
| Books Published / IPRS/ Patents            | -                                  |                                   |                        |   |  |  |
| Professional Memberships                   | -                                  |                                   |                        |   |  |  |
| Consultancy Activities                     | -                                  |                                   |                        |   |  |  |
| Awards                                     | -                                  |                                   |                        |   |  |  |
| Grants fetch                               | -                                  |                                   |                        |   |  |  |
| Interaction with Professional Institutions | -                                  |                                   |                        |   |  |  |

## **Admission**

- Number of seats sanctioned with the year of approval: 2021-2022

| PEPS<br>(PG) | CSE<br>(PG) | MBA<br>(PG) | Computer<br>Science &<br>Engineering | Electrical<br>Engineering | Electronics &<br>Telecommunication |
|--------------|-------------|-------------|--------------------------------------|---------------------------|------------------------------------|
| 24           | 24          | 60          | 60                                   | 120                       | 60                                 |

- Number of students admitted under various categories each year in the last three years:

➤ 2019-20

**First Year CSE: No. of admission: 60**

| SC | ST | NT | OBC | SBC | Muslim<br>Minority | OPEN |
|----|----|----|-----|-----|--------------------|------|
| 06 | 01 | 01 | 31  | 02  | 02                 | 17   |

**First Year Electrical Engineering : No. of admission: 09**

| SC | ST | NT | OBC | SBC | Muslim<br>Minority | OPEN |
|----|----|----|-----|-----|--------------------|------|
| 01 | 0  | 3  | 05  | 0   | 0                  | 0    |

**First Year Electronics & Telecommunication: No. of admission: Nil**

**Direct Second Year CSE: No. of admission: 20**

| SC | ST | NT | OBC | SBC | Muslim<br>Minority | OPEN |
|----|----|----|-----|-----|--------------------|------|
| 03 | 00 | 03 | 11  | 01  | 0                  | 02   |

**Direct Second Year Electrical Engineering : No. of admission:60**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 23 | 00 | 02 | 16  | 01  | 0               | 18   |

**Direct Second Year Electronics & Telecommunication: No. of admission:16**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 04 | 00 | 01 | 03  | 0   | 0               | 08   |

**M-Tech (PEPS) : No. of admission: 15**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 11 | 0  | 0  | 01  | 0   | 0               | 03   |

**M-Tech (CSE) : No. of admission: 07**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 04 | 0  | 0  | 0   | 0   | 0               | 3    |

**MBA : No. of admission: 59**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 29 | 01 | 0  | 22  | 04  | 0               | 03   |

➤ **2020-21**

**First Year CSE: No. of admission: 37**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 09 | 00 | 05 | 14  | 0   | 0               | 09   |

**First Year Electrical Engineering : No. of admission: 01**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 01 | 0  | 0  | 0   | 0   | 0               | 0    |

**First Year Electronics & Telecommunication: No. of admission: Nil**

**Direct Second Year CSE: No. of admission: 08**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 02 | 00 | 01 | 03  | 00  | 00              | 02   |

**Direct Second Year Electrical Engineering : No. of admission: 54**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 05 | 01 | 02 | 13  | 01  | 0               | 32   |

**Direct Second Year Electronics & Telecommunication: No. of admission: 12**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 02 | 01 | 00 | 02  | 00  | 00              | 07   |

**M-Tech (PEPS) : No. of admission: 17**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 06 | 02 | 01 | 04  | 0   | 0               | 04   |

**M-Tech (CSE) : No. of admission:08**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 04 | 0  | 0  | 03  | 0   | 0               | 01   |

**MBA : No. of admission: 54**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 17 | 01 | 03 | 19  | 03  | 0               | 11   |

➤ 2021-22

**First Year CSE: No. of admission: 64**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 12 | 01 | 04 | 24  | 0   | 03              | 20   |

**First Year Electrical Engineering : No. of admission: 21**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 02 | 0  | 01 | 04  | 01  | 02              | 11   |

**First Year Electronics & Telecommunication : No. of admission: 36**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 07 | 0  | 01 | 12  | 01  | 01              | 14   |

**Direct Second Year CSE: No. of admission: 36**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 10 | 02 | 03 | 11  | 01  | 0               | 09   |

**Direct Second Year Electrical Engineering : No. of admission: 133**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 21 | 02 | 07 | 54  | 04  | 0               | 45   |

**Direct Second Year Electronics & Telecommunication: No. of admission: 67**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 12 | 0  | 02 | 14  | 02  | 00              | 37   |

**M-Tech (PEPS) : No. of admission: 15**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 12 | 01 | 0  | 01  | 0   | 0               | 01   |

**M-Tech (CSE) : No. of admission: 03**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 01 | 0  | 0  | 0   | 0   | 0               | 02   |

**MBA : No. of admission: 62**

| SC | ST | NT | OBC | SBC | Muslim Minority | OPEN |
|----|----|----|-----|-----|-----------------|------|
| 27 | 01 | 03 | 08  | 02  | 0               | 21   |

# Information of Infrastructure and other Resources Available

- No. of class rooms and size:

| Sr. No. | Class Rooms        | Size (Sq.m.)  |
|---------|--------------------|---------------|
| 1       | A-307 A            | 44            |
| 2       | A-308              | 94.42         |
| 3       | A-309              | 94.42         |
| 4       | B208               | 70.25 Sq.m.   |
| 5       | B-306,B-307, B-308 | 74.8 Sq.m     |
| 6       | B-201              | 31.43 Sq.m.   |
| 7       | B-001, B-002       | 24×38 Sq. ft. |
| 8       | 303                | 94.42         |
| 9       | 304                | 77.63         |
| 10      | 308                | 73.63         |
| 11      | 307B               | 40.00         |
| 12      | B-206              | 72.8          |
| 13      | B-207              | 74.8          |
| 14      | B-208              | 75.5          |

- No. of Tutorial rooms and size:

| Sr. No. | Class Rooms    | Size (Sq.m.)  |
|---------|----------------|---------------|
| 1.      | B-003          | 24×38 Sq. ft. |
| 2       | <b>307A</b>    |               |
| 3       | B-205(A)       | 15.5          |
| 4       | <b>A-306 A</b> | <b>44</b>     |

- No. of Laboratories and size:

| Sr. No. | Class Rooms | Size (Sq.m.) |
|---------|-------------|--------------|
| 1       | B,304       | 76.4 Sq.m.   |
| 2       | B209A       | 70.25sq.m.   |
| 3       | B204        | 76.5sq.m     |
| 4       | B203        | 78.4 sq.m    |
| 5       | B-301       | 71.85sq.m    |

|    |                 |               |
|----|-----------------|---------------|
| 6  | B302            | 71.85sq.m     |
| 7  | B-303           | 74.8 sq.m     |
| 8  | <b>310, 311</b> | <b>94.42</b>  |
| 9  | <b>312</b>      | <b>80.00</b>  |
| 10 | <b>408, 409</b> | <b>79.42</b>  |
| 11 | <b>410, 411</b> | <b>74.42</b>  |
| 12 | B-001           | 215.384       |
| 13 | B-101           | 77.035        |
| 14 | B-102           | 76.32         |
| 15 | B-103           | 79.25         |
| 16 | B-105           | 79.25         |
| 17 | B-005           | 171.175       |
| 18 | <b>A-005</b>    | <b>73.63</b>  |
| 19 | <b>A-103</b>    | <b>75</b>     |
| 20 | <b>A-104</b>    | <b>113.48</b> |

• No. of Drawing Halls and Size:

| Sr. No. | Class Rooms  | Size (Sq.m.)  |
|---------|--------------|---------------|
| 1       | <b>B-004</b> | <b>151.42</b> |

• No. Workshops and Size:

| Sr. No. | Class Rooms   | Size (Sq.m.) |
|---------|---------------|--------------|
| 1       | <b>B-003A</b> | <b>221</b>   |

• No. of Computer Centers:

| Sr. No. | Class Rooms | Size (Sq.m.) |
|---------|-------------|--------------|
| 1       | <b>102</b>  | <b>150</b>   |

- **Teaching Learning Process:**

- **Teaching Learning Process:**

**INTERNAL THEORY ASSESSMENT**

| Attendance | Theory (Out of 20 M)          |    | Total<br>5 |
|------------|-------------------------------|----|------------|
|            | $\geq 75$                     | 5M |            |
|            | $\geq 62 \text{ to } \leq 74$ | 4M |            |
|            | $\leq 61 \text{ & Below}$     | 3M |            |

| Assignments | Theory (Out of 10M)           |    | Total<br>5 |
|-------------|-------------------------------|----|------------|
|             | $\geq 09 \text{ to } \leq 10$ | 5M |            |
|             | $\geq 06 \text{ to } \leq 08$ | 4M |            |
|             | $\leq 05$                     | 3M |            |

| Sessional | Theory (Out of 40M)           |           | Total<br>6 |
|-----------|-------------------------------|-----------|------------|
|           | $\geq 24$                     | 3M+3<br>M |            |
|           | $\geq 16 \text{ to } \leq 23$ | 2M        |            |
|           | $\leq 15$                     | 1M        |            |

| PUT          | Theory (Out of 10M)           |           | Total<br>4 |
|--------------|-------------------------------|-----------|------------|
|              | $\geq 48$                     | 4         |            |
|              | $\geq 36 \text{ to } \leq 46$ | 3         |            |
|              | $\leq 35$                     | 2         |            |
| <b>Total</b> |                               | <b>20</b> |            |

**INTERNAL THEORY ASSESSMENT**

| Attendance | Theory (Out of 30 M)          |     | Total<br>10 |
|------------|-------------------------------|-----|-------------|
|            | $\geq 75$                     | 10M |             |
|            | $\geq 62 \text{ to } \leq 74$ | 9M  |             |
|            | $\leq 61 \text{ & Below}$     | 8M  |             |

|             | Theory (Out of 10 M)   | Total       |
|-------------|------------------------|-------------|
| Assignments | $\geq 09$ to $\leq 10$ | 5M          |
|             | $\geq 06$ to $\leq 08$ | 4M          |
|             | $\leq 05$              | 3M          |
| Sessional   | Theory (Out of 20 M)   |             |
|             | $\geq 18$              | 10M         |
|             | $\geq 13$ to $\leq 18$ | 8M          |
| PUT         | $\leq 13$              | 7M          |
|             | Theory (Out of 20 M)   |             |
|             | $\geq 18$              | 10M         |
|             | $\geq 13$ to $\leq 18$ | 8M          |
|             | $\leq 13$              | 7M          |
|             | <b>Total</b>           | <b>30 M</b> |

### INTERNAL PRACTICAL ASSESSMENT

| Practical (Out of 25M) |                               |     | Total |
|------------------------|-------------------------------|-----|-------|
| Attendance             | $\geq 75$                     | 10M | 10    |
|                        | $\geq 60 \text{ to } \leq 74$ | 9M  |       |
|                        | $\geq 55 \text{ to } \leq 59$ | 8M  |       |
|                        | $\geq 50 \text{ to } \leq 54$ | 7M  |       |
|                        | Below 50                      | 6M  |       |

| Practical (Out of 25M)            |              |         | Total     |
|-----------------------------------|--------------|---------|-----------|
| Practical<br>Record<br>Submission | On time      | 5       | 5         |
|                                   | Late         | 3       |           |
| Viva                              | Excellent    | 8 To 10 | 10        |
|                                   | Good         | 5 To 7  |           |
|                                   | Satisfactory | 1 To 4  |           |
| <b>Total</b>                      |              |         | <b>25</b> |

- **Academic Calander:**



## RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR

(Established by Government of Central Provinces Education Department by Notification No. 513, dated 1<sup>st</sup> of August, 1923 & presently a State University governed by Maharashtra Public Universities Act, 2016/Maharashtra Act No VI of 2017)

(Academic Section)

Academic Section, Rashtrasant Tukadoji Maharaj Nagpur University, Jamnalal Bajaj Administrative Building, Mahatma Jotiba Phule Educational Premises, Campus Square to Ambazari T-Point Road, Nagpur-440033

No. Acad. /Acad .Cale. /2021/45

Date: 25<sup>th</sup> June 2021

### NOTIFICATION

It is notified for general information of all the University conducted/ constituent/ affiliated colleges and Post-Graduate Teaching Departments of the University that the Academic Calendar **for the session 2021-22 will be as under:**

**A] ACADEMIC CALENDAR FOR THE COURSES CONDUCTED AS PER SEMESTER PATTERN FOR SESSION 2021-22.**

**1. Terms & Vacation**

|                                     |   |                                 |
|-------------------------------------|---|---------------------------------|
| First Term (Odd semesters) = U.G.   | : | 02.08.2021 to 30.11.2021        |
| First Term (Odd semesters) = P.G.   | : | 30.08..2021 to 24.12.2021       |
| Diwali Holidays                     | : | 31.10.2021 to 10.11.2021        |
| Second Term (Even semesters) = U.G. | : | 10.01.2022 to 07.05.2022        |
| Second Term (Even semesters) = P.G. | : | 10.01.2022 to 07.05.2022        |
| Summer Vacation                     | : | 09.05.2022 to <b>22.06.2022</b> |

**2. Admissions\***

- a) Last date of Admission (First sem) U.G & PG : **To be notified separately**  
b) Last date of Admission other than 1<sup>st</sup> sem. U.G & PG : **20<sup>th</sup> September 2021**  
c) Last date for Admission with prior permission of the Vice-Chancellor : **20<sup>th</sup> October 2021**

**3. Last date of submission of Enrolment forms to the university**

: Within fifteen days from the last notified date of Admission

**4. Examination**

**A. Winter Examinations.**

**1. Commencement of Exam.**

- a) Failure Students in even semesters = U.G : **15<sup>th</sup> November 2021**  
b) Failure Students in even semesters = P.G : **13<sup>th</sup> December 2021**  
  
c) Regular students in odd semesters = U.G : **1<sup>st</sup> December 2021**  
d) Regular students in odd semesters = P.G : **27<sup>th</sup> December 2021**

**2. Last date for receipt of exams. forms**

- a) Regular students = U.G & PG : Within one month from the last date of admission  
b) Old Ex-Students & External Students : **15<sup>th</sup> September 2021**  
c) Ex-Students of immediately previous examination = U.G & PG : Within 15 days from the date of declaration of the result of summer Exams.

**B. Summer Exams.**

**1. Commencement of Exams.**

- a) Failure of odd semester = U.G & P.G : **25<sup>th</sup> April 2022**  
b) Regular Even semester= U.G : **9<sup>th</sup> May 2022**  
c) Regular Even semester= P.G : **9<sup>th</sup> May 2022**

**2. Last date for receipt of examinations forms**

- a) Regular Students : **1<sup>st</sup> March 2022**  
b) Ex-Students of immediately previous exam : Within 15 days from the date of declaration of the result of winter Exams.  
c) Old Ex-Students & External Students : **15<sup>th</sup> October 2021**

**5. Declaration of Results**

: As per governing provisions of the Act.

# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

*NAAC ACCREDITED*

*Dahegaon, Kalmeshwar Road, Nagpur 441501*

*Session 2021-22 (EVEN)*

## ACADEMIC CALENDAR

| Month | Days |     |     |     |     |     |     | Working Days | Activities  |
|-------|------|-----|-----|-----|-----|-----|-----|--------------|---|
|       | MON  | TUE | WED | THU | FRI | SAT | SUN |              |   |
| JAN   |      |     |     |     |     | 1   | 2   | 0            | 01-01-22 To 19-01-22 5th Sem RTMNU Exam   |
|       | 3    | 4   | 5   | 6   | 7   | 8   | 9   | 5            | 14-01-22 Faculty Contact Hour Finalization  |
|       | 10   | 11  | 12  | 13  | 14  | 15  | 16  | 5            | 18-01-22 Display of Time Table (Class/Sem. Wise)                                      |
|       | 17   | 18  | 19  | 20  | 21  | 22  | 23  | 5            | <b>20-01-22 Commencement of Classes</b>   |
|       | 24   | 25  | 26  | 27  | 28  | 29  | 30  | 4            | 20-01-22 To 24-01-22 Registration to the Department/ III Cell Activity/ T&P Activity  |
|       | 31   |     |     |     |     |     |     | 1            | 25-01-22 Finalization of Elective-II & III (8th Sem)                                  |
|       |      |     |     |     |     |     |     |              | 26-01-22 Republic Day Celebration   |
| FEB   | MON  | TUE | WED | THU | FRI | SAT | SUN |              | 03-02-22 Project Presentation-I & Review of Project                                   |
|       | 1    | 2   | 3   | 4   | 5   | 6   | 4   |              | 04-02-22 Display of Assignment-I&II, Submission: 11-02-22                             |
|       | 7    | 8   | 9   | 10  | 11  | 12  | 13  | 5            | 07-02-22 To 11-02-22 Workshop   |
|       | 14   | 15  | 16  | 17  | 18  | 19  | 20  | 5            | <b>14th To 18th Feb.22 Sessional-I</b>  |
|       | 21   | 22  | 23  | 24  | 25  | 26  | 27  | 5            | 21-02-22 Display of Result (Sessional-I) & Send Letter to Parents                     |
|       | 28   |     |     |     |     |     |     | 1            | 22-02-22 Parents Teachers Meeting   |
|       |      |     |     |     |     |     |     |              | 23-02-22 To 25-02-22 Guest Lecture/ Industrial Visit/ III Cell Activity/ T&P Activity |
|       |      |     |     |     |     |     |     |              | 28-02-22 Display of Provisional Detention List (for attendance <75% up to 25-02-22 )  |

|       | MON | TUE | WED | THU | FRI | SAT | SUN |    | 04-03-22 Display of Assignment-III&IV,<br>Submission: 11-03-22                            |
|-------|-----|-----|-----|-----|-----|-----|-----|----|---|
| MARCH |     | 1   | 2   | 3   | 4   | 5   | 6   | 3  | 07-03-22 Project Presentation-II  |
|       | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 5  | 08-03-22 To 09-03-22 Students Forum Activities  |
|       | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 4  | 14-03-2022 To 17-03-22 Webinar/<br>Industrial Visit/ III Cell Activity/ T&P Activity      |
|       | 21  | 22  | 23  | 24  | 25  | 26  | 27  | 5  | 21th to 25th Mar.22 Sessional-II  |
|       | 28  | 29  | 30  | 31  |     |     |     | 4  | 29-03-22 Display of Result (Sessional-II)<br>& Send Letter to Parents                     |
|       |     |     |     |     |     |     |     |    | 30-03-22 Parents Meeting  |
|       |     |     |     |     |     |     |     |    | 31-03-22 Review of Syllabus by HoD  |
|       |     |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     |    |   |
|       | MON | TUE | WED | THU | FRI | SAT | SUN |    | 01-04-22 Project Presentation-III   |
| APRIL |     |     |     |     | 1   | 2   | 3   | 1  | 04-04-22 To 08-04-22 STTP   |
|       | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 5  | 11-04-22 Display of Assignment-V&VI,<br>Submission: 18-04-22                              |
|       | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 3  | 18-04-22 To 22-04-22 Conduction of<br>Remidual Classes for Slow Learner<br>Students       |
|       | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 5  | 25-04-22 Final Project Report (Thesis)<br>Submission & Presentation                       |
|       | 25  | 26  | 27  | 28  | 29  | 30  |     | 5  | 25-04-22 Faculty Feedback by HoD/<br>Student Feedback by HoD                              |
|       |     |     |     |     |     |     |     |    | 26-04-22 To 29-04-22 Internal Practical<br>Submission/ III Cell Activity/ T&P<br>Activity |
|       |     |     |     |     |     |     |     |    | 29-04-22 Submission of Final Detention<br>List  |
|       |     |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     |    |   |
|       | MON | TUE | WED | THU | FRI | SAT | SUN |    |   |
| MAY   |     |     |     |     |     |     | 1   | -  | 2nd To 6th PUT Exam   |
|       | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 5  | 07-05-22 Display of Result (PUT) & Send<br>Letter to Parents                              |
|       | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 0  | 07-05-22 Last Teaching Day  |
|       | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 0  |   |
|       | 23  | 24  | 25  | 26  | 27  | 28  | 29  | 0  |   |
|       | 30  |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     |    |   |
|       |     |     |     |     |     |     |     | 85 | Total Working Days  |

| <b>List of Holidays</b> |          |                             |
|-------------------------|----------|-----------------------------|
| 26th                    | Jan.22   | Republic Day                |
| 19th                    | Feb.22   | Chhatrapati Shivaji Jayanti |
| 1st                     | March.22 | Mahashivratri               |
| 18th                    | March.22 | Holi                        |
| 2nd                     | April.22 | Gudipadva                   |
| 10th                    | April.22 | Shri Ram Navmi              |
| 14th                    | April.22 | Ambedkar Jayanti            |
| 14th                    | April.22 | Mahavir Jayanti             |
| 15th                    | April.22 | Good Friday                 |
| 1st                     | May.22   | Maharashtra Din             |
| 3rd                     | May.22   | Ramzan Eid                  |

**Academic Audit**

**28th Jan/ 25th Feb/28th March/25th April**

**Display of Subject wise Question Bank**

**10th Feb/ 17th March/ 25th April**

Academic Dean

Officiating Principal Principal

**R.T.M. Nagpur University, Nagpur**  
**FOUR-YEAR B.E. COURSE**  
**(Revised Curriculum as per AICTE Model Curriculum)**  
**SCHEME OF EXAMINATION FOR**  
**B.E. FIRST YEAR (All Branches of Engineering)**  
**(SEMESTER – I)**

| Code         | Subject                                  | Teaching Scheme |    |     |       | Credits |     |     |       | MARKS    |       |          |       |             |
|--------------|--|-----------------|----|-----|-------|---------|-----|-----|-------|----------|-------|----------|-------|-------------|
|              |  | L               | P  | T/A | Total | L       | P   | T/A | Total | Internal | Univ. | Internal | Univ. | Total Marks |
| BSE1-1T      | Mathematics-I                            | 3               | -  | 1T  | 4     | 3       | -   | 1   | 4     | 30       | 70    | -        | -     | 100         |
| BSE1-2T      | Applied Physics                          | 3               | -  | 1T  | 4     | 3       | -   | 1   | 4     | 30       | 70    | -        | -     | 100         |
| BSE1-3T      | Energy and Environment                   | 2               | -  | 1T  | 3     | 2       | -   | 1   | 3     | 30       | 70    | -        | -     | 100         |
| BSE1-4T      | Communication Skills                     | 2               | -  | -   | 2     | 2       | -   | -   | 2     | 15       | 35    | -        | -     | 50          |
| BSE1-5T      | Engineering Graphics                     | 1               | -  | -   | 1     | 1       | -   | -   | 1     | 15       | 35    | -        | -     | 50          |
| BSE1-6T      | Basics of Civil & Mechanical Engineering | 4               | -  | -   | 4     | -       | -   | -   | AUDIT | 50       | -     | -        | -     | AUDIT       |
| BSE1-2P      | Applied Physics Lab                      | -               | 3  | -   | 3     | -       | 1.5 | -   | 1.5   | -        | -     | 25       | 25    | 50          |
| BSE1-3P      | Energy and Environment Lab               | -               | 2  | -   | 2     | -       | 1   | -   | 1     | -        | -     | 25       | 25    | 50          |
| BSE1-4P      | Communication Skills Lab                 | -               | 2  | -   | 2     | -       | 1   | -   | 1     | -        | -     | 25       | 25    | 50          |
| BSE1-5P      | Engineering Graphics Lab                 | -               | 4  | -   | 4     | -       | 2   | -   | 2     | -        | -     | 25       | 25    | 50          |
|              | Three weeks Induction Program            |                 |    |     |       |         |     |     |       |          |       |          |       |             |
| <b>Total</b> |  | 15              | 11 | 3T  | 29    | 11      | 5.5 | 3   | 19.5  | 120      | 280   | 100      | 100   | 600         |

- L- Lecture , P-Practical, T- Tutorial , A- Activity (Half Credit perHour)
- Audit course marks are not counted in totalmarks

**SCHEME OF EXAMINATION FOR  
B.E. FIRST YEAR (All Branches of Engineering)  
(SEMESTER – II)**

| Code         | Subject                            | Teaching Scheme |           |              |           | Credits   |            |          |             | MARKS      |            |             |            |            |
|--------------|------------------------------------|-----------------|-----------|--------------|-----------|-----------|------------|----------|-------------|------------|------------|-------------|------------|------------|
|              |                                    | L               | P         | T/A          | Total     | L         | P          | T/A      | Total       | Theory     | Practical  | Total Marks |            |            |
| BSE2-1T      | Mathematics-II                     | 3               | -         | 1T           | 4         | 3         | -          | 1        | 4           | 30         | 70         | -           | -          | 100        |
| BSE2-2T      | Advanced Engineering Materials     | 2               | -         | 1A           | 3         | 2         | -          | 1        | 3           | 30         | 70         | -           | -          | 100        |
| BSE2-3T      | Applied Chemistry                  | 3               | -         | 1T           | 4         | 3         | -          | 1        | 4           | 30         | 70         | -           | -          | 100        |
| BSE2-4T      | Computational Skills               | 2               | -         | -            | 2         | 2         | -          | -        | 2           | 15         | 35         | -           | -          | 50         |
| BSE2-6T      | Basics of Electrical Engineering   | 2               | -         | -            | 2         | 2         | -          | -        | 2           | 15         | 35         | -           | -          | 50         |
| BSE2-7T      | Engineering Mechanics              | 2               | -         | -            | 2         | 2         | -          | -        | 2           | 15         | 35         | -           | -          | 50         |
| BSE2-8T      | Indian Culture & Constitution      | 2               | -         | -            | 2         | -         | -          | -        | AUDIT       | 50         | -          | -           | -          | AUDIT      |
| BSE1-5P      | Workshop Practices                 | -               | 4         | -            | 4         | -         | 2          | -        | 2           | -          | -          | 50          | 50         | 100        |
| BSE2-2P      | Advanced Engineering Materials Lab | -               | 2         | -            | 2         | -         | 1          | -        | 1           | -          | -          | 25          | 25         | 50         |
| BSE2-3P      | Applied Chemistry Lab              | -               | 3         | -            | 3         | -         | 1.5        | -        | 1.5         | -          | -          | 25          | 25         | 50         |
| BSE2-4P      | Computational Skills Lab           | -               | 2         | -            | 2         | -         | 1          | -        | 1           | -          | -          | 25          | 25         | 50         |
|              | Three weeks Induction Program      |                 |           |              |           |           |            |          |             |            |            |             |            |            |
| <b>Total</b> |                                    | <b>16</b>       | <b>11</b> | <b>2T+1A</b> | <b>30</b> | <b>14</b> | <b>5.5</b> | <b>3</b> | <b>22.5</b> | <b>135</b> | <b>315</b> | <b>125</b>  | <b>125</b> | <b>700</b> |

**Guidelines**

- Energy and Environment shall be taught by faculty of Chemistry and will come under board of Applied Science and Humanities (only by ChemistryDept)
- Advance Engineering Materials shall be taught by faculty of Physics and will come under board of Applied Science and Humanities (only by PhysicsDept)

# R.T.M. Nagpur University, Nagpur

## SCHEME OF EXAMINATION

### B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS ENGINEERING (SEMESTER – III)

| Code        | Subject                                      | Teaching Scheme |           |                         |           | Credit    |          |          |           | MARKS      |            |            |           | Total Marks |
|-------------|--|-----------------|-----------|-------------------------|-----------|-----------|----------|----------|-----------|------------|------------|------------|-----------|-------------|
|             |  | L               | Practical | Tutoria l/<br>Activit y | Total     | L         | P        | T/A      | Total     | Internal   | Univ.      | Intern a l | Univ.     |             |
| BEETC -301  | Applied Maths-III                            | 3               | -         | 1T                      | 4         | 3         | -        | 1        | 4         | 30         | 70         | -          | -         | 100         |
| BEETC -302T | Components for Electronic circuit design     | 3               | -         |                         | 3         | 3         | -        | -        | 3         | 30         | 70         | -          | -         | 100         |
| BEETC -302P | Components for Electronic circuit design Lab | -               | 2         | -                       | 2         | -         | 1        | -        | 1         | -          | -          | 25         | 25        | 50          |
| BEETC -303T | Digital System Design                        | 3               | -         | 1T                      | 4         | 3         | -        | 1        | 4         | 30         | 70         | -          | -         | 100         |
| BEETC -303P | Digital System Design Lab                    | -               | 2         | -                       | 2         | -         | 1        | -        | 1         | -          | -          | 25         | 25        | 50          |
| BEETC -304P | Network Theory                               | 3               | -         | -                       | 3         | 3         | -        | -        | 3         | 30         | 70         | -          | -         | 100         |
| BEETC -305T | Signal & System                              | 3               | -         | -                       | 3         | 3         | -        | -        | 3         | 30         | 70         | -          | -         | 100         |
| BEETC -306T | Measurement and Instrumentation              | 3               | -         | -                       | 3         | 3         | -        | -        | 3         | 30         | 70         | -          | -         | 100         |
| BEETC -307P | Electronics Workshop I Lab                   | -               | 2         | -                       | 2         | -         | 1        | -        | 1         | -          | -          | 25         | 25        | 50          |
| BEETC -308T | Consumer affairs                             | 2               | -         |                         | 2         |           |          |          |           |            |            | -          | -         | Audit       |
|             | <b>Total</b>                                 | <b>20</b>       | <b>6</b>  | <b>2T</b>               | <b>28</b> | <b>18</b> | <b>3</b> | <b>2</b> | <b>23</b> | <b>180</b> | <b>420</b> | <b>75</b>  | <b>75</b> | <b>750</b>  |

**SCHEME OF EXAMINATION FOR**  
**B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS**  
**ENGINEERING**  
**(SEMESTER – IV)**

| <b>Code</b> | <b>Subject</b>                           | <b>Teaching Scheme</b> |                  |                            |                | <b>Credit</b> |          |            |                | <b>MARKS</b>    |                   |                 |                  |                    |  |
|-------------|--|------------------------|------------------|----------------------------|----------------|---------------|----------|------------|----------------|-----------------|-------------------|-----------------|------------------|--------------------|--|
|             |  | <b>L</b>               | <b>Practical</b> | <b>Tutorial / Activity</b> | <b>Total I</b> | <b>L</b>      | <b>P</b> | <b>T/A</b> | <b>Total I</b> | <b>Internal</b> | <b>University</b> | <b>Internal</b> | <b>Practical</b> | <b>Total Marks</b> |  |
|             |  |                        |                  |                            |                |               |          |            |                |                 |                   |                 |                  |                    |  |
| BEETC-401T  | Microcontrollers & Applications          | 3                      | -                | 1T                         | 4              | 3             | -        | 1          | 4              | 30              | 70                | -               | -                | 100                |  |
| BEETC-401P  | Microcontrollers & Applications Lab      | -                      | 2                | -                          | 2              | -             | 1        | -          | 1              | -               | -                 | 25              | 25               | 50                 |  |
| BEETC-402T  | Analog &Digital Communications           | 3                      | -                | 1T                         | 4              | 3             | -        | 1          | 4              | 30              | 70                | -               | -                | 100                |  |
| BEETC-403P  | Analog and Digital Electronics Lab       | -                      | 2                | -                          | 2              | -             | 1        | -          | 1              | -               | -                 | 25              | 25               | 50                 |  |
| BEETC-404T  | Analog System Design                     | 3                      | -                | 1T                         | 4              | 3             | -        | 1          | 4              | 30              | 70                | -               | -                | 100                |  |
| BEETC-405T  | Data structure & Algorithm               | 3                      | -                | -                          | 3              | 3             | -        | -          | 3              | 30              | 70                | -               | -                | 100                |  |
| BEETC-406T  | HSC: Numerical Analysis with MATLAB      | 2                      | -                | -                          | 2              | 2             | -        | -          | 2              | 15              | 35                | -               | -                | 50                 |  |
| BEETC-407T  | Programming for problem solving          | 2                      | -                | -                          | 2              | 2             | -        | -          | 2              | 15              | 35                | -               | -                | 50                 |  |
| BEETC-407P  | Programming for problem solving Lab      | -                      | 4                | -                          | 4              | -             | 2        | -          | 2              |                 |                   | 25              | 25               | 50                 |  |
| BEETC-408I  | Internship                               |                        |                  |                            |                |               |          |            | 1              |                 |                   | 50              | -                | 50                 |  |
| BEETC-409A  | Audit Course HSC: Universal human values | 1                      |                  |                            | 1              |               |          |            |                |                 |                   |                 |                  | AUDIT              |  |
|             | <b>Total</b>                             | <b>17</b>              | <b>8</b>         | <b>3T</b>                  | <b>28</b>      | <b>16</b>     | <b>4</b> | <b>3</b>   | <b>24</b>      | <b>150</b>      | <b>350</b>        | <b>125</b>      | <b>75</b>        | <b>700</b>         |  |

- L- Lecture , P-Practical, T- Tutorial , A- Activity
- Audit course marks are not counted in total marks

**SCHEME OF EXAMINATION FOR**  
**B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/Electronics Engg.**  
**(SEMESTER – V)**

| <b>Code</b>  | <b>Subject</b>                | <b>Teaching Scheme</b> |          |              |              | <b>Credits</b> |          |            |              | <b>MARKS</b>  |                  |           |                    |            |
|--------------|-------------------------------|------------------------|----------|--------------|--------------|----------------|----------|------------|--------------|---------------|------------------|-----------|--------------------|------------|
|              |                               | <b>L</b>               | <b>P</b> | <b>T/A</b>   | <b>Total</b> | <b>L</b>       | <b>P</b> | <b>T/A</b> | <b>Total</b> | <b>Theory</b> | <b>Practical</b> |           | <b>Total Marks</b> |            |
| BEETC -501T  | Embedded System Design        | 2                      | -        | 1T           | 3            | 2              | -        | 1          | 3            | 30            | 70               | -         | -                  | 100        |
| BEETC -501P  | Embedded System Design Lab    | -                      | 2        | -            | 2            | -              | 1        | -          | 1            | -             | -                | 25        | 25                 | 50         |
| BEETC -502T  | Electromagnetic Waves         | 3                      | -        | 1T           | 4            | 3              | -        | 1          | 4            | 30            | 70               | -         | -                  | 100        |
| BEETC -503T  | Digital Signal Processing     | 3                      | -        | -            | 3            | 3              | -        |            | 3            | 30            | 70               | -         | -                  | 100        |
| BEETC -503P  | Digital Signal Processing Lab | -                      | 2        | -            | 2            | -              | 1        | -          | 1            | -             | -                | 25        | 25                 | 50         |
| BEETC -504OT | HSC: IEED(Economics)          | 2                      | -        | 1A           | 3            | 2              | -        | 1          | 3            | 30            | 70               |           |                    | 100        |
| BEETC -505PE | PEC-I                         | 2                      | -        | 1T           | 3            | 2              | -        | 1          | 3            | 30            | 70               | -         | -                  | 100        |
| BEETC -506P  | Electronic Workshop II        | -                      | 2        | -            | 2            |                | 1        | -          | 1            | -             | -                | 25        | 25                 | 50         |
| BEETC -507A  | Audit Course                  |                        |          |              |              |                |          |            |              |               |                  |           |                    | AUDIT      |
|              | <b>Total</b>                  | <b>12</b>              | <b>6</b> | <b>3T+1A</b> | <b>22</b>    | <b>12</b>      | <b>3</b> | <b>4</b>   | <b>19</b>    | <b>150</b>    | <b>350</b>       | <b>75</b> | <b>75</b>          | <b>650</b> |

**SCHEME OF EXAMINATION FOR**  
**B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/Electronics Engg.**  
**(SEMESTER – VI)**

| Code         | Subject                                | Teaching Scheme |          |              |           | Credit    |          |          |           | MARKS      |            |            |            | Total Marks |
|--------------|--|-----------------|----------|--------------|-----------|-----------|----------|----------|-----------|------------|------------|------------|------------|-------------|
|              |  | L               | P        | T/A          | Total     | L         | P        | T/A      | Total     | Theory     | Practical  | Internal   | Univ.      |             |
| BEETC-601T   | Computer Communication Network         | 2               | -        | -            | 2         | 2         | -        | -        | 2         | 30         | 70         | -          | -          | 100         |
| BEETC-601P   | Computer Communication Network Lab     | -               | 2        | -            | 2         | -         | 1        | -        | 1         | -          | -          | 25         | 25         | 50          |
| BEETC-602T   | Internet of Things (IOT)               | 2               | -        | -            | 2         | 2         | -        | -        | 2         | 30         | 70         | -          | -          | 100         |
| BEETC-602P   | IOT Lab                                | -               | 2        | -            | 2         | -         | 1        | -        | 1         | -          | -          | 25         | 25         | 50          |
| BEETC-603T   | Wireless Sensor Network                | 2               | -        | -            | 2         | 2         | -        | -        | 2         | 30         | 70         | -          | -          | 100         |
| BEETC-603P   | Wireless Sensor Network Lab            | -               | 2        | -            | 2         |           | 1        | -        | 1         | -          | -          | 25         | 25         | 50          |
| BEETC-604PE  | PEC-II                                 | 2               | -        | 1T           | 3         | 2         | -        | 1        | 3         | 30         | 70         | -          | -          | 100         |
| BEETC-605OE  | OE-I                                   | 2               | -        | 1A           | 3         | 2         | -        | 1        | 3         | 30         | 70         | -          | -          | 100         |
| BEETC-606T   | HSC: Effective Technical Communication | -               |          | 3A           | 3         | -         | -        | 3        | 3         | -          | -          | 50         |            | 50          |
| BEETC-607I   | Mini Project(Internship)               | -               |          | 3A           | 3         | --        | -        | 3        | 3         | -          | -          | 25         | 25         | 50          |
| BEETC-608A   | Audit Course                           | -               |          |              |           |           |          |          |           | -          | -          |            |            | AUDIT       |
| <b>Total</b> |  | <b>10</b>       | <b>6</b> | <b>1T+7A</b> | <b>24</b> | <b>10</b> | <b>3</b> | <b>8</b> | <b>21</b> | <b>150</b> | <b>350</b> | <b>150</b> | <b>100</b> | <b>750</b>  |

**SCHEME OF EXAMINATION FOR**  
**B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/Electronics Engg.**  
**(SEMESTER – VII)**

| Code        | Subject            | Teaching Scheme |          |              |           | Credit    |          |          |           | MARKS      |            |            |           | Total Marks |  |
|-------------|--------------------|-----------------|----------|--------------|-----------|-----------|----------|----------|-----------|------------|------------|------------|-----------|-------------|--|
|             |                    |                 |          |              |           |           |          |          |           | Theory     |            | Practical  |           |             |  |
|             |                    | L               | P        | T/A          | Total     | L         | P        | T/A      | Total     | Internal   | Univ.      | Internal   | Univ.     |             |  |
| BEETC-701PE | PEC-III            | 3               | 2        | 1T           | 6         | 3         | 1        | 1        | 5         | 30         | 70         | 25         | 25        | 150         |  |
| BEETC-702PE | PEC-IV             | 3               | 2        | 1T           | 6         | 3         | 1        | 1        | 5         | 30         | 70         | 25         | 25        | 150         |  |
| BEETC-703PE | PEC-V              | 3               | -        |              | 3         | 3         | -        |          | 3         | 30         | 70         | -          | -         | 100         |  |
| BEETC-704OE | OE-II              | 2               | -        | 1T           | 3         | 2         | -        | 1        | 3         | 30         | 70         | -          | -         | 100         |  |
| BEETC-705I  | Seminar/Internship | -               | 2        | -            | 2         | -         | 1        | -        | 1         | -          | -          | 50         | -         | 50          |  |
| BEETC-706A  | IPR                | 1               |          | 1A           | 2         | -         | -        | -        | -         | -          | -          | -          | -         | AUDIT       |  |
|             | <b>Total</b>       | <b>12</b>       | <b>6</b> | <b>3T+1A</b> | <b>22</b> | <b>11</b> | <b>3</b> | <b>3</b> | <b>17</b> | <b>120</b> | <b>280</b> | <b>100</b> | <b>50</b> | <b>550</b>  |  |

**SCHEME OF EXAMINATION FOR**  
**B.E. ELECTRONICS & TELECOMMUNICATION / ELECTRONICS & COMMUNICATION ENGINEERING/Electronics Engg.**  
**(SEMESTER – VIII)**

| <b>Code</b>   | <b>Subject</b>                             | <b>Teaching Scheme</b> |              |                 |              | <b>Credit</b> |          |            |              | <b>MARKS</b>  |            |                  |           |                    |  |
|---------------|--|------------------------|--------------|-----------------|--------------|---------------|----------|------------|--------------|---------------|------------|------------------|-----------|--------------------|--|
|               |  | <b>L</b>               | <b>P</b>     | <b>T/A</b>      | <b>Total</b> | <b>L</b>      | <b>P</b> | <b>T/A</b> | <b>Total</b> | <b>Theory</b> |            | <b>Practical</b> |           | <b>Total Marks</b> |  |
|               |  | <b>Internal</b>        | <b>Univ.</b> | <b>Internal</b> | <b>Univ.</b> |               |          |            |              |               |            |                  |           |                    |  |
| BEETC - 801PE | Program Elective –VI<br>MOOC/NPTEL Course  | 3                      | -            | -               | 3            | 3             | -        | -          | 3            | 30            | 70         | -                | -         | 100                |  |
| BEETC - 802PE | Program Elective -VII<br>MOOC/NPTEL Course | 3                      | -            | -               | 3            | 3             | -        | -          | 3            | 30            | 70         | -                | -         | 100                |  |
| BEETC -803P   | Project                                    | -                      | 12           | -               | 12           | -             | 6        | -          | 6            | -             | -          | 50               | 50        | 100                |  |
|               | Seminar                                    | -                      | -            | 2A              | 2            | -             | -        | 2          | 2            | -             | -          | 50               | -         | 50                 |  |
| <b>Total</b>  |  | <b>6</b>               | <b>12</b>    | <b>2A</b>       | <b>20</b>    | <b>6</b>      | <b>6</b> | <b>2</b>   | <b>14</b>    | <b>60</b>     | <b>140</b> | <b>100</b>       | <b>50</b> | <b>350</b>         |  |

## LIST OF ELECTIVE COURSES

| Semester | Elective Type        | Subject  |
|----------|----------------------|--|
| V        | Program Elective-I   | 1. Operating Systems                             |
|          |                      | 2. Information Theory and Error Correcting Codes |
|          |                      | 3. Electronic Design Techniques With HDL         |
|          |                      | 4. Sensors and Systems                           |
| VI       | Program Elective-II  | 1. Computer Architecture                         |
|          |                      | 2. Database Management Systems                   |
|          |                      | 3. Antennas & Wave Propagation                   |
|          |                      | 4. Control System Engineering                    |
|          | Open Elective-I      | 1. Consumer Electronics                          |
|          |                      | 2. Industrial Electronics                        |
| VII      | Program Elective-III | 1. Audio and Video Engineering                   |
|          |                      | 2. Web Technologies                              |
|          |                      | 3. Mobile Communications                         |
|          |                      | 4. Robotics and Automation                       |
|          | Program Elective-IV  | 1. Mixed Signal Design                           |
|          |                      | 2. Data Science/ Cloud Computing                 |
|          |                      | 3. Radar and Satellite Communication             |
|          |                      | 4. PLA and Scada                                 |
|          | Program Elective-V   | 1. Soft computing                                |
|          |                      | 2. Fundamentals of Machine Learning              |
|          |                      | 3. Optical Communication                         |
|          |                      | 4. Biomedical Engineering                        |
|          | Open Elective II     | 1. Mechatronics                                  |
|          |                      | 2. Bioengineering                                |
| VIII     | Mooc I               | 1. CMOS VLSI Design                              |
|          |                      | 2. Artificial Intelligence                       |
|          |                      | 3. Evolution of Air Interface towards 5G         |
|          |                      | 4. MEMS  |
|          | MOOC                 | 1. VLSI Signal Processing                        |
|          |                      | 2. Android Programming                           |



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**

**THIRD SEMESTER**

| Board | Subject Code | Subject                                      | Teaching Scheme |          |              |           | Credit    | MARKS      |            |            |            | Minimum Passing Marks |        |           |  |
|-------|--------------|--|-----------------|----------|--------------|-----------|-----------|------------|------------|------------|------------|-----------------------|--------|-----------|--|
|       |              |  | L               | P        | T/A          | Total     |           | Theory     |            | Practical  |            | Total                 | Theory | Practical |  |
|       |              |  |                 |          |              |           |           | Internal   | Uni.       | Internal   | Uni.       |                       |        |           |  |
| GS    | BEEE3O1T     | Electrical Engineering Mathematics           | 3               | -        | 1T           | 4         | 4         | 30         | 70         | -          | -          | 100                   | 45     |           |  |
| EE    | BEEE3O2T     | Network Analysis                             | 3               | -        | 1A           | 4         | 4         | 30         | 70         | -          | -          | 100                   | 45     |           |  |
| EE    | BEEE3O3T     | Electrical Measurement & Instrumentation     | 3               | -        | 1A           | 4         | 4         | 30         | 70         | -          | -          | 100                   | 45     |           |  |
| EE    | BEEE3O4T     | Analog Devices & Circuits                    | 3               | -        | 1A           | 4         | 4         | 30         | 70         | -          | -          | 100                   | 45     |           |  |
| EE    | BEEE3O5T     | Renewable Energy studies                     | 3               | -        | -            | 3         | 3         | 30         | 70         | -          | -          | 100                   | 45     |           |  |
| EE    | BEEE3O6T     | Introduction to Python programming           | 1               | -        | -            | 1         | 1         | 15         | 35         | -          | -          | 50                    | 23     |           |  |
|       | BEEE3O7T     | Environmental studies                        | 1               | -        | 1A           | 1         | Audit     | 50         | -          | -          | -          | Audit                 | -      |           |  |
| EE    | BEEE3O2P     | Network Analysis Lab                         | -               | 2        | -            | 2         | 1         | -          | -          | 25         | 25         | 50                    |        | 25        |  |
| EE    | BEEE3O3P     | Electrical measurement & instrumentation Lab | -               | 2        | -            | 2         | 1         | -          | -          | 25         | 25         | 50                    |        | 25        |  |
| EE    | BEEE3O4P     | Analog Devices & circuits Lab                | -               | 2        | -            | 2         | 1         | -          | -          | 25         | 25         | 50                    |        | 25        |  |
| EE    | BEEE3O6P     | Introduction to Python programming Lab       | -               | 2        | -            | 2         | 1         | -          | -          | 25         | 25         | 50                    |        | 25        |  |
|       |              | <b>Total</b>                                 | <b>17</b>       | <b>8</b> | <b>1T+4A</b> | <b>29</b> | <b>24</b> | <b>165</b> | <b>385</b> | <b>100</b> | <b>100</b> | <b>750</b>            |        |           |  |

• L- Lecture, P-Practical(Half Credit per Hour), T- Tutorial, A- Activity

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**

**FOURTH SEMESTER**

| Board | Subject Code | Subject                                 | Teaching Scheme |          |           |           | Credit    | MARKS      |            |           |           | Minimum Passing Marks |        |           |
|-------|--------------|---|-----------------|----------|-----------|-----------|-----------|------------|------------|-----------|-----------|-----------------------|--------|-----------|
|       |              |   |                 |          |           |           |           | Theory     |            | Practical |           | Total                 | Theory | Practical |
|       |              |   | L               | P        | T/A       | Total     |           | Internal   | Uni.       | Internal  | Uni.      |                       |        |           |
| EE    | BEEE4O1T     | Signal & Systems                        | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45     |           |
| EE    | BEEE4O2T     | Digital Electronics                     | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45     |           |
| EE    | BEEE4O3T     | Electrical machines-I                   | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45     |           |
| EE    | BEEE4O4T     | Power System                            | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45     |           |
| EE    | BEEE4O5T     | Electromagnetic Fields                  | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45     |           |
| EE    | BEEE4O6T     | Simulation & Programming Techniques     | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45     |           |
|       |              | Internship (2 to 3 weeks)               | -               | -        | -         | -         | 1         | -          | -          | -         | -         | -                     |        |           |
| EE    | BEEE4O2P     | Digital Electronics lab                 | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    |        | 25        |
| EE    | BEEE4O3P     | Electrical machines-I Lab               | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    |        | 25        |
| EE    | BEEE4O6P     | Simulation & Programming Techniques Lab | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    |        | 25        |
|       |              | <b>Total</b>                            | <b>18</b>       | <b>6</b> | <b>2T</b> | <b>26</b> | <b>24</b> | <b>180</b> | <b>420</b> | <b>75</b> | <b>75</b> | <b>750</b>            |        |           |

- L- Lecture, P-Practical(Half Credit per Hour), T- Tutorial, A- Activity

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**

**FIFTH SEMESTER**

| Board | Subject Code | Subject                              | Teaching Scheme |          |           |           | Credit    | MARKS      |            |           |           | Minimum Passing Marks |           |  |
|-------|--------------|--------------------------------------|-----------------|----------|-----------|-----------|-----------|------------|------------|-----------|-----------|-----------------------|-----------|--|
|       |              |                                      | Theory          |          | Practical |           |           | Total      |            |           |           | Theory                | Practical |  |
|       |              |                                      | L               | P        | T/A       | Total     |           | Internal   | Uni.       | Internal  | Uni.      |                       |           |  |
| EE    | BEEE5O1T     | Microprocessor & Microcontroller     | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE5O2T     | Control systems                      | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE5O3T     | Power electronics                    | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45        |  |
|       | BEEE5O4T     | Open elective -I                     | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE5O5T     | Professional elective-I              | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE5O1P     | Microprocessor & Microcontroller lab | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
| EE    | BEEE5O2P     | Control systems lab                  | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
| EE    | BEEE5O3P     | Power Electronics lab                | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
|       |              | <b>Total</b>                         | <b>15</b>       | <b>6</b> | <b>3T</b> | <b>24</b> | <b>21</b> | <b>150</b> | <b>350</b> | <b>75</b> | <b>75</b> | <b>650</b>            |           |  |

• L- Lecture, P-Practical(Half Credit per Hour), T- Tutorial, A- Activity

| <b>Open Electives -I</b>   |  | <b>Professional Elective-I</b>  |
|----------------------------|--|---------------------------------|
| 1. PLC and SCADA systems   |  | 1. Electrical Machine – II      |
| 2. Solar PV Systems        |  | 2. Power Station Practice       |
| 3. Organizational behavior |  | 3. Electrical Power Utilization |

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**

**SIXTH SEMESTER**

| Board | Subject Code | Subject                                   | Teaching Scheme |          |           |           | Credit    | MARKS      |            |           |           | Minimum Passing Marks |           |  |
|-------|--------------|---|-----------------|----------|-----------|-----------|-----------|------------|------------|-----------|-----------|-----------------------|-----------|--|
|       |              |   | Theory          |          | Practical |           |           | Total      |            |           |           | Theory                | Practical |  |
|       |              |   | L               | P        | T/A       | Total     |           | Internal   | Uni.       | Internal  | Uni.      |                       |           |  |
| GS    | BEEE6O1T     | Engineering Economics & Management        | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE6O2T     | Computer Applications in power system     | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE6O3T     | Switch gear & protection                  | 3               | -        | 1T        | 4         | 4         | 30         | 70         | -         | -         | 100                   | 45        |  |
|       | BEEE6O4T     | Open electives-II                         | 2               | -        | -         | 2         | 2         | 30         | 70         | -         | -         | 100                   | 45        |  |
| EE    | BEEE6O5T     | Professional elective-II                  | 3               | -        | -         | 3         | 3         | 30         | 70         | -         | -         | 100                   | 45        |  |
|       | BEEE6O6T     | Yoga & Meditation                         | 1               | -        | -         | 1         | Audit     | 50         | -          | -         | -         | Audit                 |           |  |
|       |              | Internship 3 to 4 weeks                   | -               | -        | -         | -         | 2         | -          | -          | -         | -         | -                     |           |  |
| EE    | BEEE6O2P     | Computer Applications in power system lab | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
| EE    | BEEE6O3P     | Switch gear & protection lab              | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
| EE    | BEEE6O7P     | Electrical Workshop Lab                   | -               | 2        | -         | 2         | 1         | -          | -          | 25        | 25        | 50                    | 25        |  |
|       |              | <b>Total</b>                              | <b>15</b>       | <b>6</b> | <b>2T</b> | <b>23</b> | <b>21</b> | <b>150</b> | <b>350</b> | <b>75</b> | <b>75</b> | <b>650</b>            |           |  |

• L- Lecture, P-Practical(Half Credit per Hour), T- Tutorial, A- Activity

| <b>Open Electives -II</b>                           |  | <b>Professional Elective-II</b>       |
|---|--|---------------------------------------|
| 1. Testing and maintenance of Electrical Equipments |  | 1. Electrical Installation and Design |
| 2. Advance Instrumentation                          |  | 2. Electrical Machine Design          |
| 3. Optimization Technique                           |  | 3. Electric Drives and their control  |

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**

**SEVENTH SEMESTER**

| Board | Subject Code | Subject                   | Teaching Scheme |          |           |           | Credit    | MARKS      |            |            |           | Minimum Passing Marks |        |           |
|-------|--------------|---------------------------|-----------------|----------|-----------|-----------|-----------|------------|------------|------------|-----------|-----------------------|--------|-----------|
|       |              |                           |                 |          |           |           |           | Theory     |            | Practical  |           | Total                 | Theory | Practical |
|       |              |                           | L               | P        | T/A       | Total     |           | Internal   | Uni.       | Internal   | Uni.      |                       |        |           |
| EE    | BEEE7O1T     | Professional elective-III | 3               | -        | -         | 3         | 3         | 30         | 70         | -          | -         | 100                   | 45     |           |
| EE    | BEEE7O2T     | Professional elective-IV  | 3               | -        | -         | 3         | 3         | 30         | 70         | -          | -         | 100                   | 45     |           |
| EE    | BEEE7O3T     | Professional elective-V   | 3               | -        | -         | 3         | 3         | 30         | 70         | -          | -         | 100                   | 45     |           |
| EE    | BEEE7O4T     | Open electives-III        | 3               | -        | -         | 3         | 3         | 30         | 70         | -          | -         | 100                   | 45     |           |
|       | BEEE7O5T     | Ancient Indian History    | -               | -        | -         | -         | Audit     | 50         | -          | -          | -         | Audit                 |        |           |
| EE    | BEEE7O6P     | Elective Lab-I            | -               | 2        | -         | 2         | 1         | -          | -          | 25         | 25        | 50                    |        | 25        |
| EE    | BEEE7O7P     | Elective Lab-II           | -               | 2        | -         | 2         | 1         | -          | -          | 25         | 25        | 50                    |        | 25        |
| EE    | BEEE7O8P     | Project & Seminar         | -               | -        | 3A        | 3         | 3         | -          | -          | 50         | -         | 50                    |        | 25        |
|       |              | <b>Total</b>              | <b>12</b>       | <b>4</b> | <b>3A</b> | <b>19</b> | <b>17</b> | <b>120</b> | <b>280</b> | <b>100</b> | <b>50</b> | <b>550</b>            |        |           |

• L- Lecture, P-Practical(Half Credit per Hour), T- Tutorial, A- Activity

| Open Electives III                           | Professional Elective III              | Professional Elective IV             | Professional Elective V                           |
|--|--|--------------------------------------|---|
| 1. Energy Management and Audit               | 1. Advanced Power Electronics          | 1. Fuzzy Logic and Neural Networks   | 1. Introduction to Artificial Intelligence        |
| 2. Industrial Economics and Entrepreneurship | 2. HV Engineering                      | 2. Advanced Electrical Power Systems | 2. Digital signal processing and its applications |
| 3. Electric and Hybrid Vehicles              | 3. Integrated Renewable Energy Systems | 3. Flexible AC Transmission System   | 3. Introduction to Smart Grid                     |

| Elective lab I  | Elective lab II   |
|---|---|
| 1) HV Engineering<br>OR<br>2) Electrical Drawing and Simulation | 1) Electrical Installation & Design<br>OR<br>2) Advance Power Electronics |

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**B.E. (Electrical Engineering) (CBCS)**  
**SCHEME OF EXAMINATION**  
**EIGHTH SEMESTER**

| Board | Subject Code | Subject   | Teaching Scheme |          |           |           | Credit    | MARKS     |            |            |           | Minimum Passing Marks |        |
|-------|--------------|---|-----------------|----------|-----------|-----------|-----------|-----------|------------|------------|-----------|-----------------------|--------|
|       |              |   |                 |          |           |           |           | Theory    |            | Practical  |           | Total                 | Theory |
|       |              |   | L               | P        | T/A       | Total     |           | Internal  | Uni.       | Internal   | Uni.      |                       |        |
| EE    | BEEE8O1T     | Advance Professional elective-VI #*                             | 3               | -        | -         | 3         | 3         | 30        | 70         | -          | -         | 100                   | 45     |
| EE    | BEEE8O2T     | Advance Professional elective-VII #*                            | 3               | -        | -         | 3         | 3         | 30        | 70         | -          | -         | 100                   | 45     |
|       |              | Internship (5 to 6 weeks) in Industry at appropriate work place | -               | -        | -         | -         | 4         | -         | -          | -          | -         | -                     |        |
| EE    | BEEE8O3P     | Project   | -               |          | 3A        | 3         | 3         | -         | -          | 50         | 50        | 100                   | 50     |
| EE    | BEEE8O4P     | Seminar   | -               | -        | 2A        | 2         | 2         | -         | -          | 50         | -         | 50                    |        |
|       |              | <b>Total</b>  | <b>6</b>        | <b>-</b> | <b>5A</b> | <b>11</b> | <b>15</b> | <b>60</b> | <b>140</b> | <b>100</b> | <b>50</b> | <b>350</b>            |        |

# These subjects should be undertaken through online mode.

\*Alternatively students can choose any course with 3 credits from MOOCs Platform for which the list is given below.

Additional subjects may be conducted through online courses.

Teacher shall be assigned workload for internship and industrial project.

List of MOOCs platforms which offer online certifications courses as below:-

1. SWAYAM-<https://swayam.gov.in>
2. NPTEL-<https://onlinecourses.nptel.ac.in>
3. MOOC-<http://mooc.org>

OR

Students may opt following online courses designed by BoS Electrical Engineering, RTMNU Nagpur

| Professional Elective-VI          | Professional Elective-VII         |
|-----------------------------------|-----------------------------------|
| 1. Power semiconductor drives     | 1. EHVAC / DC transmission System |
| 2. Electrical Distribution System | 2. Power Quality                  |

**RTMNU B.E. SCHEME OF EXAMINATION 2021-22**

**Scheme of Teaching & Examination of Bachelor of Engineering IV Semester B.E. (Computer Science and Engineering)**

| Sr. No.      | Course Code | Category                  | Course Name                           | Hours/ Week |            |          | Credit s     | Maximum Marks |            |            |           |            |
|--------------|-------------|---------------------------|---------------------------------------|-------------|------------|----------|--------------|---------------|------------|------------|-----------|------------|
|              |             |                           |                                       | L           | T          | P        |              | Theory        |            | Practical  |           |            |
|              |             |                           |                                       | Internal    | University | Internal | University   |               |            |            |           |            |
| 1            | BECSE401T   | Basic sciences            | Discrete Mathematics and Graph Theory | 3           | 0          | 0        | 3.00         | 30            | 70         | -          | -         | 100        |
| 2            | BECSE402T   | Professional core courses | Data Structure and Program Design     | 3           | 1          | 0        | 4.00         | 30            | 70         | -          | -         | 100        |
| 3            | BECSE402P   | Professional core courses | Data Structure and Program Design Lab | 0           | 0          | 2        | 1.00         | -             | -          | 25         | 25        | 50         |
| 4            | BECSE403T   | Professional core courses | Database Managements Systems          | 3           | 0          | 0        | 3.00         | 30            | 70         | -          | -         | 100        |
| 5            | BECSE403P   | Professional core courses | Database Managements Systems Lab      | 0           | 0          | 2        | 1.00         | -             | -          | 25         | 25        | 50         |
| 6            | BECSE404T   | Professional core courses | Computer Networks                     | 3           | 0          | 0        | 3.00         | 30            | 70         |            |           | 100        |
| 7            | BECSE405T   | Professional core courses | Theory of Computation                 | 3           | 1          | 0        | 4.00         | 30            | 70         | -          | -         | 100        |
| 8            | BECSE406T   | Professional core courses | System Programming                    | 3           | 0          | 0        | 3.00         | 30            | 70         |            |           | 100        |
| 9            | BECSE407P   | Professional core courses | Computer Workshop-II (Python)         | 0           | 0          | 2        | 1.00         | -             | -          | 25         | 25        | 50         |
| 10           | BECSE408    | Project-CS                | Internship                            | 0           | 0          | 2        | 1.00         | -             | -          | 50         | -         | 50         |
| <b>Total</b> |             |                           |                                       | <b>18</b>   | <b>2</b>   | <b>8</b> | <b>24.00</b> | <b>180</b>    | <b>420</b> | <b>125</b> | <b>75</b> | <b>800</b> |

  
 Dr. S. N. Sonelkar  
 Chairman

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: SIXTH (C.B.S.)**  
**BRANCH: COMPUTER SCIENCE & ENGINEERING**

| Sr. No.        | Subject                                   | Workload  |          |          |           | Credit    |          |          |           | Marks     |            |           |           | <b>Total Marks</b> |  |
|----------------|---|-----------|----------|----------|-----------|-----------|----------|----------|-----------|-----------|------------|-----------|-----------|--------------------|--|
|                |   | L         | P        | T        | Total     | L         | P        | T        | Total     | Theory    |            | Practical |           |                    |  |
|                |   | Sess.     | Univ.    | Sess.    | Uni       |           |          |          |           |           |            |           |           |                    |  |
| 1<br>BECSE306T | Artificial Intelligence                   | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -         | -         | 100                |  |
| 2<br>BECSE307T | Design Patterns                           | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -         | -         | 100                |  |
| 3<br>BECSE307P | Design Patterns lab                       | -         | 2        | -        | 2         | -         | 1        | -        | 1         | -         | -          | 25        | 25        | 50                 |  |
| 4<br>BECSE308T | Software Engineering & Project Management | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -         | -         | 100                |  |
| 5<br>BECSE309T | Computer Networks                         | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -         | -         | 100                |  |
| 6<br>BECSE309P | Computer Networks Lab                     | -         | 2        | -        | 2         | -         | 1        | -        | 1         | -         | -          | 25        | 25        | 50                 |  |
| 7<br>BECSE310T | Functional English                        | 2         | -        | 1        | 3         | 2         | -        | 1        | 3         | 10        | 40         | -         | -         | 50                 |  |
| 8<br>BECSE311P | Mini Project                              | -         | 2        | -        | 2         | -         | 2        | -        | 2         | -         | -          | 25        | 25        | 50                 |  |
|                | <b>Total</b>                              | <b>18</b> | <b>6</b> | <b>5</b> | <b>29</b> | <b>18</b> | <b>4</b> | <b>5</b> | <b>27</b> | <b>90</b> | <b>360</b> | <b>75</b> | <b>75</b> | <b>600</b>         |  |

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: EIGHTH (C.B.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

| Sr. No.        | Subject                          | Workload  |          |          |           | Credit    |          |          |           | Marks     |            |            |            |             |
|----------------|----------------------------------|-----------|----------|----------|-----------|-----------|----------|----------|-----------|-----------|------------|------------|------------|-------------|
|                |                                  | L         | P        | T        | Total     | L         | P        | T        | Total     | Theory    |            | Practical  |            | Total Marks |
|                |                                  |           |          |          |           |           |          |          |           | Sess.     | Univ.      | Sess.      | Uni.       |             |
| 1<br>BECSE406T | Distributed Operating system     | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -          | -          | 100         |
| 2<br>BECSE406P | Distributed Operating system Lab | -         | 2        | -        | 2         | -         | 1        | -        | 1         | -         | -          | 25         | 25         | 50          |
| 3<br>BECSE407T | Information & Cyber Security     | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -          | -          | 100         |
| 4<br>BECSE407P | Information & Cyber Security Lab | -         | 2        | -        | 2         | -         | 1        | -        | 1         | -         | -          | 25         | 25         | 50          |
| 5<br>BECSE408T | ELECTIVE-III                     | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -          | -          | 100         |
| 6<br>BECSE409T | ELECTIVE-IV                      | 4         | -        | 1        | 5         | 4         | -        | 1        | 5         | 20        | 80         | -          | -          | 100         |
| 7<br>BECSE410P | Project & Seminar                | -         | 5        | -        | 5         | -         | 5        | -        | 5         | -         | -          | 75         | 75         | 150         |
|                | <b>Total</b>                     | <b>16</b> | <b>9</b> | <b>4</b> | <b>29</b> | <b>16</b> | <b>7</b> | <b>4</b> | <b>27</b> | <b>80</b> | <b>320</b> | <b>125</b> | <b>125</b> | <b>650</b>  |

**Elective III:** Pattern Recognition, Soft Computing Techniques, Optimization Techniques, Clustering & Cloud Computing.

**Elective IV:** Advance Wireless Sensor Network, Digital Image Processing, Natural Language Processing, Digital Forensic.

**COURSE SCHEME Of**  
**First, Second, Third & Fourth Semester**  
**Choice Base Credit System (CBCS)**  
**Of**  
**Master of Technology (M.Tech)**

**In**  
***Computer Science and Engineering***  
**(CSE) Of**  
**RASHTRASANT TUKDOJI MAHARAJ**  
**NAGPUR UNIVERSITY, NAGPUR**

**I Semester M. Tech. (CSE)**

|  |  | <b>Teaching<br/>Scheme</b> | <b>Examination<br/>Scheme</b> |                 |
|--|--|----------------------------|-------------------------------|-----------------|
|  |  |                            | <b>Theory</b>                 | <b>Practica</b> |

| Subject Code          | Subject                                | I             |    |                |                          |            |            |             |                    |                       |                    |
|-----------------------|--|---------------|----|----------------|--------------------------|------------|------------|-------------|--------------------|-----------------------|--------------------|
|                       |  | Hour per week |    | No. of Credits | Duration of Paper (Hrs.) | Max. Marks | Max. Marks | Total Marks | Min. Passing Marks | Max. Marks            | Max. Marks         |
|                       |  | L             | P  |                |                          |            |            |             |                    | University Assessment | College Assessment |
| PGCSE101T             | High Performance Computer Architecture | 4             | -  | 4              | 3                        | 70         | 30         | 100         | 50                 | -                     | -                  |
| PGCSE102T             | Advances in Operating System Design    | 4             | -  | 4              | 3                        | 70         | 30         | 100         | 50                 | -                     | -                  |
| PGCSE103T             | Data Science                           | 4             | -  | 4              | 3                        | 70         | 30         | 100         | 50                 | -                     | -                  |
| PGCSE104T             | Elective -I<br>(Discipline Specific)   | 4             | -  | 4              | 3                        | 70         | 30         | 100         | 50                 | -                     | -                  |
| PGOPEN105T            | Elective -II<br>(Open)                 | 4             | -  | 4              | 3                        | 70         | 30         | 100         | 50                 | -                     | -                  |
| PGCSE106P             | Laboratory -I<br>(HPCA)                | -             | 2  | 1              | -                        | -          | -          | -           | 50                 | 50                    | 100                |
| PGCSE107P             | Laboratory -II<br>(AOSD)               | -             | 2  | 1              | -                        | -          | -          | -           | 50                 | 50                    | 100                |
| <b>Total</b>          |  | 20            | 4  |                | -                        | 350        | 150        | 500         | -                  | 100                   | 100                |
| <b>Semester Total</b> |  | 24            | 22 |                |                          |            |            |             | 700 Marks          |                       |                    |

**Elective –I (Discipline Specific) PGCSE104/1T-Software Architecture, PGCSE104/2T-AI and Expert System Design**

**Elective –II (Open) PGOPEN105/1T-Advance Data Mining and Big Data Analytics, PGOPEN105/2T-Cyber Forensic and Computer Crimes**

**Semester M. Tech. (CSE)**

| Subject<br>Code | Subject                               | Teaching<br>Scheme   |                   | Examination<br>Scheme              |                   |                   |                    |                              |                                  |                           |                    |                              |    |
|-----------------|---------------------------------------|----------------------|-------------------|------------------------------------|-------------------|-------------------|--------------------|------------------------------|----------------------------------|---------------------------|--------------------|------------------------------|----|
|                 |                                       |                      |                   | Theory                             |                   |                   |                    | Practical                    |                                  |                           |                    |                              |    |
|                 |                                       | Hour<br>sper<br>week | No. of<br>Credits | Duratio<br>n of<br>Paper<br>(Hrs.) | Max.<br>Mark<br>s | Max.<br>Mark<br>s | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks | Max.<br>Mark<br>s                | Max.<br>Mark<br>s         | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks |    |
|                 |                                       | L                    | P                 |                                    |                   |                   |                    |                              | Univers<br>ity<br>Assess<br>ment | College<br>Assess<br>ment |                    |                              |    |
| PGCSE201T       | Advances in Algorithms                | 4                    | -                 | 4                                  | 3                 | 70                | 30                 | 100                          | 50                               | -                         | -                  | -                            | -  |
| PGCSE202T       | Advance Computer Network and Security | 4                    | -                 | 4                                  | 3                 | 70                | 30                 | 100                          | 50                               | -                         | -                  | -                            | -  |
| PGCSE203T       | Advance Digital Image Processing      | 4                    | -                 | 4                                  | 3                 | 70                | 30                 | 100                          | 50                               | -                         | -                  | -                            | -  |
| PGCSE204T       | Elective -III (Discipline)            | 4                    | -                 | 4                                  | 3                 | 70                | 30                 | 100                          | 50                               | -                         | -                  | -                            | -  |
| PGFD205T        | Foundation Course -I                  | 4                    | -                 | 4                                  | 3                 | 70                | 30                 | 100                          | 50                               | -                         | -                  | -                            | -  |
| PGCSE206P       | Laboratory -III (AA)                  | -                    | 2                 | 1                                  | -                 | -                 | -                  | -                            | -                                | 50                        | 50                 | 100                          | 50 |
| PGCSE207P       | Laboratory -IV (ADIP)                 | -                    | 2                 | 1                                  | -                 | -                 | -                  | -                            | -                                | 50                        | 50                 | 100                          | 50 |
| <b>Tot</b>      |                                       | 20                   | 4                 | -                                  | 35                | 150               | 50                 | -                            | 100                              | 100                       | 20                 | -                            |    |

|                       |    |    |  |   |  |           |  |  |  |   |
|-----------------------|----|----|--|---|--|-----------|--|--|--|---|
| <b>al</b>             |    |    |  | 0 |  | 0         |  |  |  | 0 |
| <b>Semester Total</b> | 24 | 22 |  |   |  | 700 Marks |  |  |  |   |

**Elective –III (Discipline Specific) PGCSE204/1T-Advance Multimedia System,  
PGCSE204/2T-Internet of ThingsFoundation Course –I PGFD205T -Research  
Methodology**

**Semester M. Tech. (CSE)**

| Subject<br>Code       | Subject               | Teaching<br>Scheme   |                   | Examination<br>Scheme              |                                  |                           |                    |                              |                                  |                           |                    |                              |   |
|-----------------------|-----------------------|----------------------|-------------------|------------------------------------|----------------------------------|---------------------------|--------------------|------------------------------|----------------------------------|---------------------------|--------------------|------------------------------|---|
|                       |                       |                      |                   | Theory                             |                                  |                           |                    |                              | Practical                        |                           |                    |                              |   |
|                       |                       | Hour<br>sper<br>week | No. of<br>Credits | Duratio<br>n of<br>Paper<br>(Hrs.) | Max.<br>Mark<br>s                | Max.<br>Mark<br>s         | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks | Max.<br>Mark<br>s                | Max.<br>Mark<br>s         | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks |   |
|                       |                       | L                    | P                 |                                    | Univers<br>ity<br>Assess<br>ment | College<br>Assess<br>ment |                    |                              | Univers<br>ity<br>Assess<br>ment | College<br>Assess<br>ment |                    |                              |   |
| PGOPEN301T            | Elective-IV (Open)    | 4                    | -                 | 4                                  | 3                                | 70                        | 30                 | 100                          | 50                               | -                         | -                  | -                            | - |
| PGFD302T              | Foundation Course -II | 4                    | -                 | 4                                  | 3                                | 70                        | 30                 | 100                          | 50                               | -                         | -                  | -                            | - |
| PGCSE303P             | Project Seminar       | -                    | -                 | 8                                  | -                                | -                         | -                  | -                            | -                                | 200                       | 200                | 100                          |   |
| <b>Total</b>          |                       | 8                    | -                 | -                                  |                                  | 140                       | 60                 | 200                          | -                                | -                         | 200                | 200                          | - |
| <b>Semester Total</b> |                       | 8                    |                   | 16                                 | 400 Marks                        |                           |                    |                              |                                  |                           |                    |                              |   |

**Elective -IV (Open) PGOPEN301/1T- Security Analysis of Software,  
PGOPEN301/2T- Advance Databases Foundation Course -II PGFD302T -Project  
planning and Management**

**Semester M. Tech. (CSE)**

| Subject<br>Code       | Subject | Teaching<br>Scheme   |                   | Examination<br>Scheme              |                                  |                           |                    |                                  |                           |                   |                    |                              |
|-----------------------|---------|----------------------|-------------------|------------------------------------|----------------------------------|---------------------------|--------------------|----------------------------------|---------------------------|-------------------|--------------------|------------------------------|
|                       |         |                      |                   | Theory                             |                                  |                           |                    |                                  | Practical                 |                   |                    |                              |
|                       |         | Hour<br>sper<br>week | No. of<br>Credits | Duratio<br>n of<br>Paper<br>(Hrs.) | Max.<br>Mark<br>s                | Max.<br>Mark<br>s         | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks     | Max.<br>Mark<br>s         | Max.<br>Mark<br>s | Total<br>Mark<br>s | Min.<br>Passin<br>g<br>Marks |
|                       |         | L                    | P                 |                                    | Univers<br>ity<br>Assess<br>ment | College<br>Assess<br>ment |                    | Univers<br>ity<br>Assess<br>ment | College<br>Assess<br>ment |                   |                    |                              |
| PGCSE401<br>P         | Project | -                    | -                 | 16                                 | -                                | -                         | -                  | -                                | 400                       | -                 | 400                | 200                          |
| <b>Total</b>          |         | -                    | -                 |                                    | -                                | -                         | -                  | -                                | 400                       | -                 | 400                | -                            |
| <b>Semester Total</b> |         | -                    |                   | 16                                 | 400 Marks                        |                           |                    |                                  |                           |                   |                    |                              |

**Absorption Scheme**

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters  
**I Semester M. Tech. (CSE)**

**Table-1**

| <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b>                             |  | <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b>  |  |
|---------------------------|--|--|---------------------------|---|--|
| PG-CSE1-01                | High Performance Computer Architecture           |  | PGCSE101T                 | High Performance Computer Architecture                        |  |
| PG-CSE1-02                | Advances in Operating System Design              |  | PGCSE102T                 | Advances in Operating System Design                           |  |
| PG-CSE1-03                | Object Oriented Systems                          |  | -----                     | -----   |  |
| PG-CSE1-04/1              | Artificial Intelligence and Expert System Design |  | PGCSE104/2T               | Elective -I (Discipline Specific) AI and Expert System Design |  |
| PG-CSE1-04/2              | Data Warehousing & Mining                        |  | -----                     | -----   |  |
| PG-CSE1-05/1              | Neural Network & Fuzzy System                    |  | -----                     | -----   |  |
| PG-CSE1-05/2              | Real Time Systems                                |  | -----                     | -----   |  |
| PG-CSE1-05/3              | Mobile Computing                                 |  | -----                     | -----   |  |
| PG-CSE1-06                | Computer System Lab-1                            |  | -----                     | -----   |  |
| PG-CSE1-07                | Seminar-1  |  | -----                     | -----   |  |

**Table-2**

| <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b> |  | <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b> | <b>Remark</b> |
|---------------------------|----------------------|--|---------------------------|----------------------|---------------|
|---------------------------|----------------------|--|---------------------------|----------------------|---------------|

|           |  |            |  |  |
|-----------|--|------------|--|--|
| PGCSE101T | High Performance Computer Architecture | PG-CSE1-01 | High Performance Computer Architecture | PG-CSE1-01<br>Not Clear<br>Have to appear New PGCSE101T  |
| PGCSE102T | Advances in Operating System Design    | PG-CSE1-02 | Advances in Operating System Design    | PG-CSE1-02<br>Not Clear<br>Have to appear New PGCSE102T  |
| PGCSE103T | Data Science                           | -----      | -----                                  | Have to appear PGCSE103T   |
| PGCSE104T | Elective –I<br>(Discipline Specific)   | -----      | -----                                  | If you Have Clear old PG-CSE1-04/1 Then don't appear PGCSE104T Otherwise Have to appear New PGCSE104T Elective –I<br>(Discipline Specific) |
| PGOPEN105 | Elective –II<br>(Open)                 | -----      | -----                                  | Have to appear   |
| PGCSE106P | Laboratory –I<br>(HPCA)                | -----      | -----                                  | Have to appear   |
| PGCSE107P | Laboratory –II<br>(AOSD)               | -----      | -----                                  | Have to appear   |

Proposed Scheme of Absorption of Old course to New course of First to Fourth Semesters

## II Semester M. Tech. (CSE)

**Table-1**

| <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b>              |  | <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b>                                 |  |
|---------------------------|-----------------------------------|--|---------------------------|--|--|
| PG-CSE2-01                | Advances in Algorithm             |  | PGCSE201T                 | Advances in Algorithm                                |  |
| PG-CSE2-02                | TCP / IP and Internet             |  | -----                     | -----  |  |
| PG-CSE2-03                | Advanced Digital Image Processing |  | PGCSE203T                 | Advance Digital Image Processing                     |  |
| PG-CSE2-04/1              | Distributed Systems               |  | -----                     | -----  |  |
| PG-CSE2-04/2              | Software Engineering              |  | -----                     | -----  |  |
| PG-CSE2-04/3              | Pattern Recognition               |  | -----                     | -----  |  |
| PG-CSE2-05/1              | Embedded Systems                  |  | -----                     | -----  |  |
| PG-CSE2-05/2              | Cryptography and Network Security |  | -----                     | -----  |  |
| PG-CSE2-05/3              | Multimedia Systems                |  | PGCSE204/1T               | Elective –III (Discipline) Advance Multimedia System |  |
| PG-CSE1-06                | Seminar-II                        |  | -----                     | -----  |  |
| PG-CSE1-07                | Comprehensive Viva-Voce           |  | -----                     | -----  |  |

**Table-2**

| <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b>                  | <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b>              | <b>Remark</b>   |
|---------------------------|---------------------------------------|---------------------------|-----------------------------------|---|
| PGCSE201T                 | Advances in Algorithm                 | PG-CSE2-01                | Advances in Algorithm             | PG-CS2-01 Not Clear Have to appear New PGCSE201T  |
| PGCSE202T                 | Advance Computer Network and Security | -----                     | -----                             | Have to appear PGCSE202 T   |
| PGCSE203T                 | Advance Digital Image Processing      | PG-CSE2-03                | Advanced Digital Image Processing | PG-CS2-03 Not Clear Have to appear New PGCSE203T  |
| PGCSE204T                 | Elective –III (Discipline)            | -----                     | -----                             | If you Have Clear old PG-CSE2-05/3 Then don't appear PGCSE204T Otherwise Have to appear New PGCSE204T |
| PGFD205T                  | Foundation Courses –I                 | -----                     | -----                             | Have to appear Foundation Courses –I  |
| PGCSE206P                 | Laboratory –III (AA)                  | -----                     | -----                             | Have to appear  |
| PGCSE207P                 | Laboratory –IV (ADIP)                 | -----                     | -----                             | Have to appear  |

### III & IV Semester M. Tech. (CSE)

**Table-1**

| <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b> |  | <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b> |  |
|---------------------------|----------------------|--|---------------------------|----------------------|--|
| PG-CSE 34                 | Project              |  | PGCSE303P                 | Project Seminar      |  |
|                           |                      |  | PGCSE401P                 | Project              |  |

**Table-2**  
**Semester M. Tech. (CSE)**

| <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b>  |  | <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b> | <b>Remark</b>  |
|---------------------------|-----------------------|--|---------------------------|----------------------|----------------|
| PGOPEN301T                | Elective-IV (Open)    |  | -----                     | -----                | Have to appear |
| PGFD302T                  | Foundation Course -II |  | -----                     | -----                | Have to appear |
| PGCSE303P                 | Project Seminar       |  | -----                     | -----                | Have to appear |

**Semester M. Tech. (CSE)**

| <b>Subject Code (NEW)</b> | <b>Subject (NEW)</b> |  | <b>Subject Code (OLD)</b> | <b>Subject (OLD)</b> | <b>Remark</b>  |
|---------------------------|----------------------|--|---------------------------|----------------------|----------------|
| PGCSE401P                 | Project              |  | -----                     | -----                | Have to appear |

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**  
**Scheme of Teaching and Examination**  
**I Semester M. Tech. CBCS Power Electronics and Power System (PEPS)**

| Subject Code          | Subject                    | Teaching Scheme |   | Examination Scheme |   |                       |                    |             |                    |  |  |
|-----------------------|----------------------------|-----------------|---|--------------------|---|-----------------------|--------------------|-------------|--------------------|--|--|
|                       |                            | Hours per week  |   | No. of Credits     | Duration of Paper (Hrs.)  | Max. Marks            | Max. Marks         | Total Marks | Min. Passing Marks |  |  |
|                       |                            | L               | P |                    |   | University Assessment | College Assessment |             |                    |  |  |
| PGPEPS 101T           | Advanced Power Electronics | 4               | - | 4                  | 3   | 70                    | 30                 | 100         | 50                 |  |  |
| PGPEPS 102T           | Power System Modeling      | 4               | - | 4                  | 3   | 70                    | 30                 | 100         | 50                 |  |  |
| PGPEPS 103T           | Advanced Control Theory    | 4               | - | 4                  | 3   | 70                    | 30                 | 100         | 50                 |  |  |
| PGPEPS 104T           | Elective -I                | 4               | - | 4                  | 3   | 70                    | 30                 | 100         | 50                 |  |  |
| PGOPE N 105T          | Elective -II (Open)        | 4               | - | 4                  | 3   | 70                    | 30                 | 100         | 50                 |  |  |
| PGPEPS 106P           | Advanced Power Electronics | -               | 2 | 1                  | -   | 50                    | 50                 | 100         | 50                 |  |  |
| PGPEPS 107P           | Power System Simulation    | -               | 2 | 1                  | -   | 50                    | 50                 | 100         | 50                 |  |  |
| <b>Total</b>          |                            | 20              | 4 |                    | -   | 450                   | 250                | 700         | -                  |  |  |
| <b>Semester Total</b> |                            | 24              |   | 22                 | 700 Marks   |                       |                    |             |                    |  |  |
| Elective -I (Core)    |                            |                 |   |                    | 1. Power System Dynamics and Control<br>2. Application of Microcontroller in Electrical System<br>3. Micro and Smart Grid |                       |                    |             |                    |  |  |
| Elective-II (Open)    |                            |                 |   |                    | List of Open Electives from various discipline is attached  |                       |                    |             |                    |  |  |

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**  
**Scheme of Teaching and Examination**

**II Semester M. Tech. CBCS Power Electronics and Power System (PEPS)**

| Subject Code          | Subject                    | Teaching Scheme   |   |                | Examination Scheme   |                       |                    |                    |    |
|-----------------------|----------------------------|-------------------|---|----------------|--|-----------------------|--------------------|--------------------|----|
|                       |                            | Theory/ Practical |   |                |  |                       | Total Marks        | Min. Passing Marks |    |
|                       |                            | Hours per week    |   | No. of Credits | Duration of Paper (Hrs.)   | Max. Marks            |                    |                    |    |
|                       |                            | L                 | P |                |  | University Assessment | College Assessment |                    |    |
| PGPEPS 201T           | HVDC and FACTS             | 4                 | - | 4              | 3  | 70                    | 30                 | 100                | 50 |
| PGPEPS 202T           | Power Quality              | 4                 | - | 4              | 3  | 70                    | 30                 | 100                | 50 |
| PGPEPS 203T           | Advanced Electrical Drives | 4                 | - | 4              | 3  | 70                    | 30                 | 100                | 50 |
| PGPEPS 204T           | Elective –III              | 4                 | - | 4              | 3  | 70                    | 30                 | 100                | 50 |
| PGFD 205T             | Research Methodology       | 4                 | - | 4              | 3  | 70                    | 30                 | 100                | 50 |
| PGPEPS 206P           | Power Quality Lab          | -                 | 2 | 1              | -  | 50                    | 50                 | 100                | 50 |
| PGPEPS 207P           | Advanced Electrical Drives | -                 | 2 | 1              | -  | 50                    | 50                 | 100                | 50 |
| <b>Total</b>          |                            | 20                | 4 |                | -  | 450                   | 250                | 700                | -  |
| <b>Semester Total</b> |                            | 24                |   | 22             | 700 Marks  |                       |                    |                    |    |
| Elective –III (Core)  |                            |                   |   |                | 1. Energy Audit and Management<br>2. Converter for Non Conventional Energy Sources<br>3. Power System Planning |                       |                    |                    |    |

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**  
**Scheme of Teaching and Examination**

**III Semester M. Tech. CBCS Power Electronics and Power System (PEPS)**

| Subject Code          | Subject                         | Teaching Scheme |   |  | Examination Scheme       |                   |            |             |                    |
|-----------------------|---------------------------------|-----------------|---|--|--------------------------|-------------------|------------|-------------|--------------------|
|                       |                                 | Hours per week  |   | No. of Credits   | Duration of Paper (Hrs.) | Theory/ Practical |            |             |                    |
|                       |                                 | L               | P |  |                          | Max. Marks        | Max. Marks | Total Marks | Min. Passing Marks |
| PGOPEN 301T           | Elective –IV (Open)             | 4               | - | 4  | 3                        | 70                | 30         | 100         | 50                 |
| PGFD 302T             | Project Planning and Management | 4               | - | 4  | 3                        | 70                | 30         | 100         | 50                 |
| PGPEPS 303P           | Project Seminar                 | -               | 8 | 8  | -                        | --                | 200        | 200         | 100                |
| <b>Total</b>          |                                 | 8               | 8 | 16   | -                        | 140               | 260        | 400         | -                  |
| <b>Semester Total</b> |                                 | 16              |   | 16   | 400 Marks                |                   |            |             |                    |
| Elective-IV (Open)    |                                 |                 |   | List of Open Electives from various discipline is attached |                          |                   |            |             |                    |

Note: For the teaching work load calculation for Project Seminar, work load will be 3 hours per week per project

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**

**Scheme of Teaching and Examination**

**IV Semester M. Tech. CBCS Power Electronics and Power System (PEPS)**

| Subject Code          | Subject | Teaching Scheme |    |                | Examination Scheme       |                   |            |             |                    |
|-----------------------|---------|-----------------|----|----------------|--------------------------|-------------------|------------|-------------|--------------------|
|                       |         | Hours per week  |    | No. of Credits | Duration of Paper (Hrs.) | Theory/ Practical |            |             |                    |
|                       |         | L               | P  |                |                          | Max. Marks        | Max. Marks | Total Marks | Min. Passing Marks |
| PGPEPS 401P           | Project | -               | 16 | 16             | -                        | 400               | --         | 400         | 200                |
| <b>Semester Total</b> |         | 16              |    | 16             | 400 Marks                |                   |            |             |                    |

Note: For the teaching work load calculation for project, work load will be 6 hours per week per project



## **RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY**

### **DIRECTION NO. 37 OF 2019**

**“ADMISSIONS AND EXAMINATIONS LEADING TO THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION (OUTCOME BASED – CBCS), IN THE FACULTY OF COMMERCE & MANAGEMENT, DIRECTION, 2019”.**

(Issued by the Vice-Chancellor under section 12(8) of the Maharashtra Public Universities. Act, 2016)(Mah. Act No. VI of 2017)

WHEREAS, the Maharashtra Public Universities Act, 2016 ( No. VI of 2017) (hereinafter the “Act”) has come into force with effect from 1st March, 2017 and the same has been made applicable to Rashtrasant Tukdoji Maharaj Nagpur University ;

AND

WHEREAS, the Direction No. 22 of 2017 entitled “DIRECTION REGARDING CHOICE BASED CREDIT SYSTEM AND EXAMINATIONS LEADING TO THE MASTERS DEGREE OF BUSINESS ADMINISTRATION IN THE FACULTY OF COMMERCE AND MANAGEMENT, RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR”, was issued under Section 12(8) of the Act;

AND

WHEREAS, the Board of Studies in Business Administration and Business Management (hereinafter the “Board of Studies”) in its meeting held on 30<sup>th</sup> October 2018 decided to revise the curriculum for MBA course in accordance with the model curriculum prescribed by the Apex Body, AICTE and for that purpose constituted a Sub-Committee to prepare the draft of the new syllabus;

AND

WHEREAS, the Board of Studies in its meeting held on 9<sup>th</sup> May 2019 approved the revised scheme of examination and syllabus submitted by the Sub-Committee constituted for the said purpose;

AND

WHEREAS, the Faculty of Commerce and Management in its meeting held on 30<sup>th</sup> May 2019 approved the revised scheme of examination and syllabus suggested by the Board of Studies and the same was subsequently approved by the Academic Council of the university in its meeting held on 10<sup>th</sup> June 2019;

AND

WHEREAS, as per the provisions of sub section 1 of Section 73 of the act an ordinance is required to be made for regulating admission of the students to a course

of study leading to the award of a degree in a particular discipline of the study but the making of an ordinance is a time consuming process and there is an exigency in introduction of the new syllabus of the MBA course from the Academic Session 2019-20;

Now, therefore, I, Dr. Siddarthavinayak P. Kane the Vice-Chancellor of the university in exercise of my powers under Section 12(8) of the Act, do hereby issue the following direction:

1. This Direction shall be called: "ADMISSIONS AND EXAMINATIONS LEADING TO THE AWARD OF DEGREE OF MASTER OF BUSINESS ADMINISTRATION (OUTCOME BASED – CBCS), IN THE FACULTY OF COMMERCE & MANAGEMENT, DIRECTION, 2019".
2. This Direction shall come into the force from the date of its issuance.
3. In this Direction unless the context requires otherwise;
  - a. "College" College means and includes all the colleges, institutes and departments conducted by or affiliated to the Rashtrasant Tukadoji Maharaj Nagpur University, offering the AICTE approved MBA program.
  - b. "Competent Authority" means All India Council of Technical Education.
  - c. "Course" means a subject (theory as well as practical) included in the curriculum of MBA program under this Direction.
  - d. "Program" means a Master of Business Administration program.
  - e. "University" means The Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
4. The duration of M.B.A. programme, under this Direction, shall be of Two years consisting of four semesters i.e Semesters-I & II in first year and Semesters-III & IV in second year.
5. Subject to compliance with the provisions of this direction and of other ordinances in force from time to time, an applicant for admission to this course shall have passed the degree examination of University or any other recognized University equivalent thereto with 50% aggregate marks for open category students and 45% aggregate marks for the Backward Class candidates or as notified by the State Government (Competent Authority) from time to time. Provided that Students who have passed the Common

Management Aptitude Test (CMAT) conducted by All India Council for Technical Education or the Common Entrance Test (CET) conducted by the Directorate of Technical Education or any other entrance examination conducted by any competent authority approved by the Directorate of Technical Education and fulfilling the other eligibility conditions, which may be prescribed by the University, alone shall be admitted to this programme.

6. The Examinations for Semesters I, II, III and IV shall be held twice in a year at such places and on such dates as may be fixed by the University.
7. The fees for examination shall be as prescribed by the University from time to time.
8. A student admitted to the MBA programme under this Direction, in pursuance of provisions of para 5 above or in pursuance of the absorption scheme hereunder, shall not be eligible to join any other programme (under graduate or a post-graduate) in this university or any other university simultaneously.
9. In order to be eligible for appearing in the end semester examination conducted by the university the student must have pursued a regular course of study for not less than 90 days, to be certified by the Director/Head/Principal of the Institution/College/Department of the college or the University, in that semester.
10. Without prejudice to the other provisions of Ordinance No. 6 relating to the Examinations in General, the provisions of Paragraphs 5, 7, 8, 10, 26 and 31 of the said Ordinance shall apply to collegiate candidate, registered for the course governed by this Direction.
11. **Outcome Based Student Centric Evaluation:** The program and its all courses shall have well defined outcomes to be attained by the student on completion of the program/course. The question papers shall be set to assess the attainment of these outcomes.
12. **Choice Based Credit System (CBCS):** The MBA program shall consist of 30 courses including a project equivalent to 1 course in any of the specialization area opted by the student and an Exit Seminar equivalent to 1 course. The courses in this program are of **two kinds: Core and Elective, as detailed below. The elective courses also include MOOCs.**
  - f. **Core Course:** - This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a program in a said discipline of study (Comprising of basic subjects of Business Management).

- g. **Elective Course:** -It is a course which can be chosen from the pool of courses. The course may be specific/specialized/supportive or advanced to the discipline of study.

A student is required to Select *Any Two* Electives as follows-

- Either both the Electives from Core Group  
**OR**
- One Elective each from Core Group and Complementary Group

|                            |   |
|----------------------------|---|
| <b>Core Group</b>          | Financial Management<br>Marketing Management<br>Human Resource Management                             |
| <b>Complementary Group</b> | Operations Management<br>Business Analytics<br>Entrepreneurship Development<br>International Business |

**Note:** The affiliated Management Institutes / Colleges/ Department shall declare the Elective/Specialization it is offering before the commencement of admission process of Semester -I in their Information Brochure and website and communicate the same to the University well in advance. The Institute will offer the Specialization only if minimum **TEN** students opt for the same.

- a. **MOOCs :** - Every student admitted to this program has to successfully complete TWO Massive Online Open Courses available on portal to become eligible for the award of MBA degree. The credit points of MOOCs earned by a student shall be transferred in the Mark list of Semester IV. The student has liberty to complete these two courses any time during the MBA program after his/her admission and it is not restricted to any specific semester/s. However, the student is advised to successfully complete these MOOCs before 4<sup>th</sup> Semester.
- b. In compliance with the Choice Based Credit System, the student is free to opt for any course available on the SWAYAM/NPTEL portal during a particular semester provided the course has minimum **4 credits**. Following guidelines are to be followed by the concerned stakeholders such as students, University and Institute/College/ Department to enable student to opt for MOOC and the credit transfer of such MOOC completed by the student.

- i. The Institute/College/Department shall provide the list of courses (**with minimum 4 Credits/minimum duration of 12 weeks**) available in the beginning of each semester to students on its website, college notice boards and through other medium of communication. Similarly, such a list shall also be published on the University's website.
- ii. A student may select the course (**with minimum 4 Credits/minimum duration of 12 weeks**) of her/his choice from the available courses and register for the same.
- iii. A student is also required to appear and successfully complete the online examination for the MOOC opted by him/her.
- iv. The successful completion of TWO such MOOCs comprising of total **8 Credit Points** is mandatory for every student to become eligible for the award of degree.
- v. If a student has completed a MOOC carrying more than 4 credits, then only 4 credits shall be considered and be shown in the mark list of 4<sup>th</sup> Semester against such course.
- vi. In case, the MOOC certificate does not have a mention of Credits, the Principal/Director/Head shall certify the number of credits for which a course of minimum duration of 12 weeks shall be considered equivalent to 4 credits.
- vii. A student is expected to fill the examination form for Semester IV along with the titles of courses (MOOC courses) he/she had completed or pursuing.
- viii. The University shall provide an option as 'MOOC-1' and 'MOOC- 2' in the drop-down list while filling up the online examination form for IVth Semester.
- ix. The marks/grade obtained by the student in such MOOCs shall be submitted by the Institute/College/Department (with copy of Certificate) to the University along with Internal Assessment Marks for Semester IV.
- x. In case a student is not able to complete TWO MOOCs by the end of Semester IV, he/she shall be marked absent in MOOC - 1 and MOOC - 2 subjects in the Semester IV Mark list. Such students, on successful completion of MOOCs and submission of certificates to that effect, shall be declared successful and become eligible for award of degree.
- xi. The Board of Studies in Business Administration and Business Management shall appoint a 'Steering Committee' to deal with the difficulties and problems of students/Institutes arising out of this scheme.
- xii. The online examination of such courses (MOOC) is conducted by Host Institutions and not by the University and the dates of examination are declared at the beginning of the session. Hence, the University shall keep these days free from its MBA

Examination Time-Table and shall not schedule any End Semester Examination on such dates.

- xiii. The examination fee of MOOCs is to be paid and borne by the student separately.

### **13. Credit Based Teaching and Evaluation Scheme:**

#### **Induction Cum Foundation Course:**

This course is aimed at making the student ready to pursue higher education in business management. As a graduate of any stream/faculty is eligible to take admission to this program, the Institute/College/Department may have students from various streams such as Commerce, Humanities, Science, Engineering or any other Interdisciplinary studies. Hence, every institute shall organize an Induction Cum Foundation Course for First Year Students before commencement of academic session for First Semester. The desired contents of such Induction Course is provided in **Appendix No. 3**.

#### ***Guidelines for Induction Cum Foundation Course:***

- The Induction Course shall have minimum 40 contact hours.
- The Induction Course does not carry any Credit and hence the evaluation of students is not mandatory at the end of this Course.
- The Institute/College/Department shall organize the Induction Course before commencement of classes for First Semester and ensure the attendance of all enrolled students for the same.
- The Institute/College/Department shall keep proper record of the Induction Course to be verified by the competent authority, if needed.
- The contents of Induction Course provided in **Appendix No.3** are minimum and the Institute/College/Department is free to add any relevant content as they deem fit.

- 14. Courses offered, contact hours, credits attached and allocation of marks shall be as follows:**

| Course Code  | Course Name   | Internal / University Examination Instruction Hours | Tutorial Hours | Total Hours | Marks              |                     |            | Credits   |   |
|--------------|---|---|----------------|-------------|--------------------|---------------------|------------|-----------|---|
|              |   |   |                |             | Semester End Exam. | Internal Assessment | Total      |           |   |
| 1T1          | Managerial  | Uni.  | 20             | 10          | 30                 | 80                  | 20         | 100       | 3 |
| 1T2          | Management Information Systems                        | Uni.  | 20             | 10          | 30                 | 80                  | 20         | 100       | 3 |
| 1T3          | Business Research                                     | Uni.  | 10             | 20          | 30                 | 80                  | 20         | 100       | 3 |
| 1T4          | Organizational Behaviour                              | Uni.  | 25             | 05          | 30                 | 80                  | 20         | 100       | 3 |
| 1T5          | Financial Reporting, Statements and Analysis          | Uni.  | 20             | 10          | 30                 | 80                  | 20         | 100       | 3 |
| 1T6          | Business Statistics and Analytics for Decision Making | Uni.  | 20             | 10          | 30                 | 80                  | 20         | 100       | 3 |
| 1T7          | Legal and Business Environment                        | Uni.  | 25             | 05          | 30                 | 80                  | 20         | 100       | 3 |
| 1P8          | Managerial Skills for Effectiveness                   | Internal  | 10             | 20          | 30                 | 00                  | 100        | 100       | 3 |
| <b>Total</b> |   | <b>150</b>  | <b>90</b>      | <b>240</b>  | <b>560</b>         | <b>240</b>          | <b>800</b> | <b>24</b> |   |

| Course Code | Course Name               | Internal / University Examination Instruction Hours | Tutorial Hours | Total Hours | Marks              |                     |       | Credits |   |
|-------------|---------------------------|---|----------------|-------------|--------------------|---------------------|-------|---------|---|
|             |                           |   |                |             | Semester End Exam. | Internal Assessment | Total |         |   |
| 2T1         | Financial Management      | Uni.  | 20             | 10          | 30                 | 80                  | 20    | 100     | 3 |
| 2T2         | Marketing                 | Uni.  | 25             | 05          | 30                 | 80                  | 20    | 100     | 3 |
| 2T3         | Human Resource Management | Uni.  | 25             | 05          | 30                 | 80                  | 20    | 100     | 3 |
| 2T4         | Operations Management     | Uni.  | 20             | 10          | 30                 | 80                  | 20    | 100     | 3 |
| 2T5         | International Business    | Uni.  | 25             | 05          | 30                 | 80                  | 20    | 100     | 3 |

|              |                          |          |            |           |           |            |            |            |           |
|--------------|--------------------------|----------|------------|-----------|-----------|------------|------------|------------|-----------|
| 2T6          | CSR and Sustainability   | Uni.     | 25         | 05        | 30        | 80         | 20         | 100        | 3         |
| 2T7          | Cost Accounting          | Uni.     | 20         | 10        | 30        | 80         | 20         | 100        | 3         |
| 2T8          | Management Case Analysis | Internal | 20         | 20        | 40        | 00         | 100        | 100        | 4         |
| <b>Total</b> |                          |          | <b>180</b> | <b>70</b> | <b>25</b> | <b>560</b> | <b>240</b> | <b>800</b> | <b>25</b> |

### Semester-III

| Course Code  | Course Name                          | Internal / University Examination | Instruction Hours | Tutorial Hours | Total Hours | Marks              |                     |            | Credits   |
|--------------|--------------------------------------|-----------------------------------|-------------------|----------------|-------------|--------------------|---------------------|------------|-----------|
|              |                                      |                                   |                   |                |             | Semester End Exam. | Internal Assessment | Total      |           |
| 3P1          | Summer Internship Project Assessment | Internal                          | 15                | 45             | 60          | 00                 | 100                 | 100        | 6         |
| 3T2          | Elective I - Paper 1                 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T3          | Elective I - Paper 2                 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T4          | Elective I - Paper 3                 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T5          | Elective II -Paper 1                 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T6          | Elective II-Paper 2                  | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T7          | Elective II- Paper 3                 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100        | 4         |
| 3T8          | Strategic Management                 | Uni.                              | 25                | 05             | 30          | 80                 | 20                  | 100        | 3         |
| <b>Total</b> |                                      |                                   | <b>220</b>        | <b>110</b>     | <b>330</b>  | <b>560</b>         | <b>240</b>          | <b>800</b> | <b>33</b> |

### Semester-IV

| Course Code | Course Name           | Internal / University Examination | Instruction Hours | Tutorial Hours | Total Hours | Marks              |                     |       | Credits |
|-------------|-----------------------|-----------------------------------|-------------------|----------------|-------------|--------------------|---------------------|-------|---------|
|             |                       |                                   |                   |                |             | Semester End Exam. | Internal Assessment | Total |         |
| 4T1         | Elective I - Paper 4  | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100   | 4       |
| 4T2         | Elective II - Paper 4 | Uni.                              | 30                | 10             | 40          | 80                 | 20                  | 100   | 4       |
| 4M3         | MOOC 1                | MOOC Assessment                   | 20                | 20             | 40          | 00                 | 100                 | 100   | 4       |

|              |                               |                 |            |            |            |            |            |            |           |
|--------------|-------------------------------|-----------------|------------|------------|------------|------------|------------|------------|-----------|
| 4M4          | MOOC 2                        | MOOC Assessment | 20         | 20         | 40         | 00         | 100        | 100        | 4         |
| 4P5          | Project Work and Viva Voce    | Uni.            | 10         | 30         | 40         | 50         | 50         | 100        | 4         |
| 4S6          | Exit Seminar and Open Defense | Uni.            | 10         | 30         | 40         | 100        | 00         | 100        | 4         |
| <b>Total</b> |                               |                 | <b>120</b> | <b>120</b> | <b>240</b> | <b>310</b> | <b>290</b> | <b>600</b> | <b>24</b> |

#### Summary of the Total Marks and Credits

| Sr. No.      |                | Instruction Hours | Tutorial Hours | Total Hours | Marks        |                     |             | Credits    |
|--------------|----------------|-------------------|----------------|-------------|--------------|---------------------|-------------|------------|
|              |                |                   |                |             | Semester End | Internal Assessment | Total       |            |
| 1            | Semester - I   | 150               | 90             | 240         | 560          | 240                 | 800         | 24         |
| 2            | Semester - II  | 180               | 70             | 250         | 560          | 240                 | 800         | 25         |
| 3            | Semester - III | 220               | 110            | 330         | 560          | 240                 | 800         | 33         |
| 4            | Semester - IV  | 120               | 120            | 240         | 310          | 290                 | 600         | 24         |
| <b>Total</b> |                | <b>670</b>        | <b>390</b>     | <b>1060</b> | <b>199</b>   | <b>101</b>          | <b>3000</b> | <b>106</b> |

- a. The End Semester written examination of all the courses shall be conducted by the University.
- b. The performance of the learners will be evaluated in two Components, one component will be the continuous assessment by the Institute/College/Department (Internal Assessment) carrying 20% marks and the second component will be the End Semester Examination (conducted by the University) carrying 80% marks.

#### **The allocation of Internal Assessment Marks**

|    |   |          |
|----|---|----------|
| 1a | Attendance of the student during a particular semester                    | 05 marks |
| 1b | An assignment based on curriculum to be assessed by the teacher concerned | 05 marks |
| 1c | Subject wise class test conducted by the teacher concerned                | 05 marks |
| 1d | Subject presentation/viva-voce seminar conducted during the               | 05       |

|                               |  |            |
|-------------------------------|--|------------|
|                               | semester                                   | marks      |
| <b>1</b>                      | <b>Internal assessment Total marks</b>     | <b>20</b>  |
| <b>2</b>                      | <b>Semester wise End Examination marks</b> | <b>80</b>  |
| <b>Total Marks Per Course</b> |  | <b>100</b> |

- Marks for internal assessment, awarded on the basis of tests, assignment etc. as prescribed above by the teacher in the respective subject and moderated by the Director shall be *notified on the college notice board and institute website for information of students* and it shall be communicated to the University at least 5 days before the commencement of the End Semester examination.
  - The college shall preserve the answer sheets and assignments submitted by the students and attendance record and evaluation sheets for at least *five* academic years, while the summary of the internal marks to be preserved as a permanent record.
  - A student has to pass each course/subject *jointly* in University Assessment and Internal Assessment. There is no provision for reassessment of Internal Assessment marks.
- c. **Summer Training:** At the end of second semester, all students will have to undergo summer training of 6-10 weeks with an industrial, business or service organization by taking a project study. The condition of successfully completing the program shall not be deemed to have been satisfied unless a student undergoes summer training under the supervision of the department in organizations as approved by the Director/ Principal/ Head / Faculty from time to time. Alternatively Director/ Principal/ Head / Faculty of the Department/ College/ Institute may allocate the sector/ industry/ company specific project to the individual student. Each student will be required to submit a project report to the Department/ College/ Institute for the work undertaken during this period within *three* weeks of commencement of the third semester for the purpose of evaluation in the third semester. The detailed parameters for evaluation of SIP projects are provided in **Appendix No. 3**.

**15. Credit and Grade Point System:**

**Conversion of Marks to Grades and Calculations of SGPA (Grade Point Average) and CGPA (Cumulative Grade Point Average):** In the Credit and Grade Point System, the assessment of individual Courses in the concerned examinations will be on the basis of marks only, but the marks shall later be converted into Grades by the mechanism herein specified wherein the overall performance of the Learners can be reflected after considering the Credit Points for any given course. However, the overall evaluation shall be designated in terms of Grade. There are some abbreviations used here that need understanding of each and every parameter involved in grade

computation and the evaluation mechanism. The abbreviations and formulae for this purpose are as follows:-

Abbreviations and Formulae Used

G: Grade

GP: Grade Points

C: Credits

CP: Credit Points

CG: Credits X Grades (Product of credits & Grades)

SGPA =  $\Sigma CG$ : Sum of Product of Credits & Grades points /  $\Sigma C$ : Sum of Credits points

SGPA: Semester Grade Point Average shall be calculated for individual semesters. (It is also designated as GPA)

CGPA: Cumulative Grade Point Average shall be calculated for the entire Program by considering all the semesters taken together.

While calculating the CG the value of Grade Point 1 shall be consider Zero (0) in case of students who failed in the concerned course/s i.e. obtained the marks below 50.

After calculating the SGPA for an individual semester and the CGPA for entire program, the value can be matched with the grade in the Grade Point table as per the TEN (10) Points Grading System and expressed as a single designated GRADE such as O, A, B, etc....

**Calculation of SGPA:**

**Illustration for Calculation of SGPA**

| Sr. N o. | Name of Subject                | Credi ts | Marks obtain ed out of 80 | Internal Assessm ent Marks (Out of 20) | Total Mar ks (Out of 100) | Grad e Poin ts | Credit Points (CreditsXGrade) |
|----------|--------------------------------|----------|---------------------------|--|---------------------------|----------------|-------------------------------|
| 1        | Managerial Economics           | 3        | 43                        | 17                                     | 60                        | 7              | 21                            |
| 2        | Management Information Systems | 3        | 52                        | 18                                     | 70                        | 8              | 24                            |
| 3        | Business Research              | 3        | 54                        | 18                                     | 72                        | 8              | 24                            |
| 4        | Organization                   | 3        | 63                        | 17                                     | 80                        | 9              | 27                            |

|   |   |           |    |    |    |    |             |
|---|---|-----------|----|----|----|----|-------------|
|   | nal<br>Behaviour                                      |           |    |    |    |    |             |
| 5 | Financial Reporting, Statements and Analysis          | 3         | 54 | 18 | 72 | 8  | 24          |
| 6 | Business Statistics and Analytics for Decision Making | 3         | 43 | 17 | 60 | 7  | 21          |
| 7 | Legal and Business Environment                        | 3         | 63 | 17 | 80 | 9  | 27          |
| 8 | Managerial Skills for Effectiveness                   | 3         | -  | -  | 85 | 10 | 30          |
|   |   | <b>24</b> |    |    |    |    | <b>198</b>  |
|   | <b>Thus, SGPA = 198/24</b>                            |           |    |    |    |    | <b>8.25</b> |

**Calculation of CGPA:**

$$CGPA = \frac{\sum SGPA \times Credits}{\sum Credits}$$

#### Illustration for Calculation of CGPA

| Semester     | Total Credits | SGPA | SGPA X Credits |
|--------------|---------------|------|----------------|
| I            | 24            | 8.25 | 198            |
| II           | 24            | 9    | 216            |
| III          | 34            | 8.6  | 292.4          |
| IV           | 24            | 8    | 192            |
| <b>TOTAL</b> | <b>106</b>    |      | <b>898.4</b>   |

Thus, CGPA = 898.4/106 = **8.48**

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the Mark list / Transcript.

After calculating the SGPA for an individual semester and the CGPA for entire program, the value can be matched with the grade in the Grade Point table as per the ten (10) Points Grading System and expressed as a single designated GRADE such as O, A+, A, B+, B, etc.

| Marks        | Grade    | Grade Points |
|--------------|----------|--------------|
| 85 and Above | O        | 10           |
| 84-75        | A        | 9            |
| 74-65        | B        | 8            |
| 64-60        | C        | 7            |
| 59-55        | D        | 6            |
| 54-50        | E        | 5            |
| 49 and Below | F (Fail) | 0            |

Conversion of CGPA into Grades and Division shall be as follows:

| CGPA    | Grade    | Division    |
|---------|----------|-------------|
| 9.0-10  | O        | Distinction |
| 8.0-8.9 | A        | Distinction |
| 7.0-7.9 | B        | Distinction |
| 6.0-6.9 | C        | First       |
| 5.5-5.9 | D        | Second      |
| 5.0-5.4 | E        | Second      |
| 00-4.9  | F (Fail) | Fail        |

Note: Final Mark List will only show the Grade, Grade points and Division and not the marks.

16. The award of grace marks for passing an examination and securing higher Grades shall be as per the governing Ordinance/Direction of the university.
17. **Conversion of CGPA into Equivalent Percent Marks:**  
The CGPA obtained by an examinee shall be converted into the aggregate percent marks by using the following formula. This formula shall be printed on the Semester IV Mark list of the examinee.  
**Equivalent Aggregate Percentage Marks = 10(CGPA - 0.75)**
18. **Project Work and Exit Seminar:** Project Work and Exit Seminar will be compulsory for each student appearing at the semester- IV Examination.  
(i) Project Work shall carry 100 marks as follows-

| Head of Passing | Marks |
|-----------------|-------|
|-----------------|-------|

|  |            |
|--|------------|
| Project Report Evaluation and Viva-Voce by External Examiner | 50         |
| Project Report Evaluation and Viva-Voce by Internal Examiner | 50         |
| <b>TOTAL</b>   | <b>100</b> |

(ii) Exit Seminar shall carry 100 marks as follows -

| <b>Head of Passing</b>   | <b>Marks</b> |
|--|--------------|
| Exit Seminar and Open Defense to be conducted by External Examiner | 100          |
| <b>TOTAL</b>   | <b>100</b>   |

(iii) For Project work a batch of Maximum **TWENTY** students per guide/supervisor has to be allotted by the Institute/College/Department. The Guide/Supervisor shall act as an internal examiner for project Examination.

(iv) The guide or the supervisor shall be appointed by the institute/college/department and should be teaching in the MBA Programme with minimum qualifications as prescribed by AICTE for Assistant Professor.

(v) The External examiner for Project Evaluation and Exit Seminar shall be appointed from the list of full time approved teaching faculty of the MBA programme by the University.

(vi) Each such External examiner shall examine a maximum of **TWENTY** students in the academic year.

(vii) **ONE copy** of Project work (Printed and hard bound) shall be submitted to the Institute/College/Department at least one month before commencement of MBA Semester IV Examination for evaluation purpose. The Institute/college/Department shall retain the copy of Project Work for evaluation and the list of 'Project Work Titles' of all students shall be submitted to the University.

**A Candidate shall submit with his/her project work, a certificate from the Supervisor to the effect:-**

- That the candidate has satisfactorily completed the Project work for not less than one session;
- That the Project work is the result of the candidate's own work and is of sufficiently high standard to warrant its presentation for examination.
- Candidate shall submit his declaration that the Project is the result of his own research work and the same has not been previously submitted for any examination of this University or any other University. The Project shall be liable to be rejected and / or cancelled if found otherwise.
- The Project work shall be evaluated through Seminar and Viva-voce at the Institute/College/ Department by internal examiner appointed by

Director/Principal/Head and external examiners appointed by University within 10 days of the completion of Semester IV examination.

- The Exit Seminar Presentation and Open Defence shall be evaluated through Seminar, Presentation and Open Defence at the Institute/college/department by external examiners appointed by the University within 15 days.
- A student appearing for the Semester IV Examination will have to pay additional fees as prescribed by the University from time to time.

**(viii) Exit Seminar**

Exit Seminar is a culmination and presentation of all the learning that has happened in all *four* semesters of MBA program. The idea is to check the key learnings of a student manager and to map them with the program outcomes so as to assess the attainment of program outcomes. The Viva-Voce should be targeted at assessment of following POs.

**MBA Program Outcomes:**

1. Apply knowledge of management theories and practices to solve business problems
2. Foster Analytical and Critical thinking abilities for data-based decision making
3. Ability to develop Value Based Leadership ability
4. Ability to understand, analyze and communicate global, economic, legal, and ethical areas of business
5. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

This will also present the student portfolio evaluation i.e. a systematic and organized collection of a student's work that exhibits the direct evidence of a student's efforts, achievements and progress over a period of MBA program including Theory Papers, SIP, Live Projects, MOOCs, etc.

**Evaluation of Exit Seminar:**

- The individual presentation should ideally last for 15-20 minutes followed by Open Defence Question-Answer session.
- The External Examiner (appointed by the University) should evaluate Maximum 20 (Maximum 10 at One Institute) Exit Seminars.

**Exit Seminar and Open Defence:**

**Format for Presentation-**

Presentation should include following-

1. Summary of Learning from core courses across semesters
2. Summary of Learning from elective 1 courses
3. Summary of Learning from elective 2 courses
4. Summary of Learning from MOOCs

5. Summary of Learning from Summer Internship Project
6. Summary of Learning from Project Work
7. Exhibition of student portfolio i.e. a systematic and organized collection of a student's work that exhibits the direct evidence of a student's efforts, achievements and progress over a period of time including Theory Papers, SIP, Live Projects, MOOCs, etc.
8. Level of Attainment of PO1 with justification
9. Level of Attainment of PO2 with justification
10. Level of Attainment of PO3 with justification
11. Level of Attainment of PO4 with justification
12. Level of Attainment of PO5 with justification
13. Concluding Remark

**Open Defense** – The external examiner should ask questions to check the attainment of 5 POs

**Evaluation of Exit Seminar:**

- The individual presentation should ideally last for 15-20 minutes followed by Open Defence Question-Answer session (10-15 minutes).
- The External Examiner (appointed by the University) should evaluate Maximum 20 (Maximum 10 at One Institute) Exit Seminars.

*Rubrics and detailed parameters for evaluation of Project Work and Exit Seminar are mentioned in Appendix 3.*

19. **The scope of the subject, percentage of passing in theory and project will be governed as per following rules:**
  1. There will be a combined passing of 50% marks to be secured by an examinee in internal and University written examination taken together for each course/subject/paper.
  2. The results of successful candidates at the end of semester-IV shall be declared on the basis of CGPA obtained in all the four semesters. However, the formula for conversion of CGPA into equivalent marks should be printed on Semester IV Mark list.
  3. The candidates who successfully clear all the semester examinations in the first attempt are eligible for ranks provided they secure Grade C and above.
  4. The results of the candidates who have successfully cleared the Semester-IV examination but not cleared the lower semester examinations shall be declared as NCL (not completed lower semester examinations). Such candidates shall be eligible for the award of Degree only after successfully clearing all the lower semester examinations.
  5. Student successfully clearing Semester I, II, III and IV examinations shall, on payment of the prescribed fee, be awarded a Degree in the prescribed form signed by the Vice-Chancellor.

6. An examinee failing to clear any end semester examination shall be eligible for re-examination on payment of a fresh Examination Fee as prescribed by the University.
- 20. Promotion to Higher Semester (ATKT)-**
- An examinee failing to clear any semester examination shall be ALLOWED TO KEEP TERM (ATKT) in accordance with the provisions of Clause No. 11 of Direction No. 10 of 2019 in following manner:-

| Admission to Semester | Eligibility for admission and taking University Examination  |
|-----------------------|--|
| Ist Semester          | Candidate should have passed the qualifying examination as per the relevant Direction governing the course.  |
| IIInd Semester        | Candidate should have completed the term of the Ist semester and filled examination form.  |
| IIIrd Semester        | Candidate should have completed the term of the IIInd semester, filled the examination form of the same and has obtained exemption in 2/3 <sup>rd</sup> passing heads of the Ist and IIInd semesters taken together. |
| Ivth Semester         | Candidate should have completed the term of the IIIrd semester and filled the examination form of the same.  |

- 21. Rejection of results:**
- A candidate who fails in one or more course(s) of a semester may be permitted to reject the result of the whole examination of that semester. Rejection of result course-wise shall not be permitted. A candidate who rejects the results shall appear in the examination of that semester in the subsequent examination.
  - Rejection can be exercised only once in each semester and the rejection once exercised cannot be revoked.
  - Application for rejection of result along with payment of the prescribed fee shall be submitted to the University through the Institute/College/Department along with the original statement of marks within 30 days from the date of publication of the result.
  - A candidate who rejects the result is eligible for only class and not for ranking.

- 22. Improvement of results:-**
- The examinee of any of the semesters of MBA program shall be eligible for improvement of results in accordance with the governing law of the university.

**23. Guidelines for Setting Question Papers of Semester I, II, III & IV End Examinations.**

- a. The question paper should be set in such a manner so as to cover the complete syllabus as prescribed by the University.
- b. The duration of the Semester End Examination shall be 3.00 Hours per course/subject.
- c. The evaluation of the Summer Internship Project should be conducted at the Institute/College/Department by the Examiner appointed by the Principal/Director/Head of the Institute/ Department.
- d. The evaluation of Semester IV Project and Viva Voce should be conducted at Institute/College/Department by the Project Supervisor of the student and an External Examiner appointed for the same by the University.
- e. The evaluation of Semester IV Exit Seminar and Open Defense should be conducted at Institute/College/Department by an External Examiner appointed for the same by the University.
- f. The result for these examinations should be declared within time limit as per University norms and communicated to the University within stipulated time.
- g. The record of conduct of such examination, evaluation and results should be maintained for a period of at least FIVE years by the respective Institute/Department for the verification by the competent authority.
- h. The format for question papers for Semester End Examinations to be conducted by the University shall be as follows:
  1. There shall be **FIVE** compulsory **questions of 16 marks each**.
  2. All the questions shall have internal choice within the questions, i.e. there shall be 2 questions from each module/unit of the curriculum with an internal option.
  3. The concerned Board of Studies shall develop a question bank of 10questions for each module/unit of each course/subject.
  4. The question bank shall be prepared on the following guidelines:
    - a. The questions shall be framed to assess the attainment of Course Outcomes defined in Appendix - 3 for each module/unit of each course/subject. Taxonomy shall be referred while framing the questions.
    - b. The competent authority shall prepare a panel of examiners for preparing a question bank.
    - c. The remuneration to be paid for preparing a question bank shall be decided by the competent authority according to the prevailing norms.
    - d. A question bank of 10 questions per module/unit (carrying 16 marks each) shall be submitted to the University before commencement of the academic session.
    - e. The examiner shall also mandatorily submit a detailed scheme of evaluation (Memorandum of Instructions for both numerical and theory questions) along with the question bank to enhance the objectivity and maintain consistency in evaluation.

- f. The Subject Examination Committee shall moderate the questions submitted by examiners and pick up the appropriate questions to set the question paper in the pattern detailed below:

#### **ILLUSTRATIVE PATTERN OF QUESTION PAPER**

- Q.1 (A) ..... *based on module/unit 1*  
*OR*  
 Q.1(B) ..... *based on module/unit 1*
- Q.2(A) ..... *based on module/unit 2*  
*OR*  
 Q.2(B) ..... *based on module/unit 2*
- Q.3(A) ..... *based on module/unit 3*  
*OR*  
 Q.3(B) ..... *based on module/unit 3*
- Q.4(A) ..... *based on module/unit 4*  
*OR*  
 Q.4(B) ..... *based on module/unit 4*
- Q.5(A) ..... *based on module/unit 5*  
*OR*  
 Q.5(B) ..... *based on module/unit 5*

**24. Not Fit for the Course:-**

If a student fails to pass the M.B.A. programme within FIVE successive years from the date of his/her admission he/she shall be declared Not Fit for the Course (NFC), and shall not be allowed to appear for any examination of the programme.

**25. Absorption Scheme:-**

The failure students of the MBA programme as per Direction No. 22 of 2017 (Introduced in 2016 the old programme) immediately preceding the course under this Direction shall be given chance to appear for *three* more consecutive examinations according to old syllabus.

- a. The University shall conduct the examination of old programme for three more consecutive examinations after the new scheme of examination is introduced as per following table:

| Semester<br>Examination | Attempt-1   | Attempt-2      | Attempt-3   |
|-------------------------|-------------|----------------|-------------|
| Semester-I              | Winter 2019 | Summer<br>2020 | Winter 2020 |

|              |                |                |                |
|--------------|----------------|----------------|----------------|
| Semester-II  | Summer<br>2020 | Winter 2020    | Summer<br>2021 |
| Semester-III | Winter 2020    | Summer<br>2021 | Winter 2021    |
| Semester-IV  | Summer<br>2021 | Winter 2021    | Summer 2022    |

The students are required to clear all their papers/subjects/courses within the stipulated time. The students clearing all the papers/subject/courses of the old programme in permissible number of attempts shall be awarded degree according to the scheme of Examination for the old programme.

In case a student is not able to clear her/his papers in given attempts as per old scheme of examination, she/he shall be absorbed in the MBA programme under this Direction in the following manner:

I. A student who has passed Semester I and II in the given three attempts will be eligible for admission to Second Year of MBA.

- a. Such a student will be required to take a casual admission to First year by paying Rs. Five Hundred only.
- b. Such a student will be required to fill the examination form for Sem I and Sem II and appear and pass the subjects for which there was no equivalent paper in old MBA programme.
- c. The new mark list as per this Direction shall be generated for Sem I and Sem II wherein the marks of equivalent subjects (as mentioned in the table given hereunder) shall be mentioned.
- d. The marks for subject 'Business Communication and Information Systems' as per old programme shall be mentioned against two subjects i.e. 'Management Information Systems' and 'Managerial Skills for Effectiveness' as per this Direction.
- e. The marks for subject 'Research Methodology and Quantitative Techniques' as per old programme shall be mentioned against two subjects i.e. 'Business Statistics and Analytics for Decision Making' and 'Business Research' as per this Direction.
- f. The marks for 'Strategic Management' as per this Direction shall be mentioned if the student has passed 'Strategic Management' of MBA Sem III of old programme. If not, the student will have to appear for the same paper as per this Direction.
- g. Every such student will have to appear for the subject 'CSR and Sustainability', if she/he has not passed either 'Environment Management' or 'Business Ethics and Corporate Governance' as per old syllabus of the old programme.
- h. Such a student will have to appear for Sem III examination as per this Direction. However, the student will be entitled for the equivalent subjects she/he had passed as per the old MBA programme.

**II.** A student who has failed in one or more subjects of Semester I and II will be eligible for admission to Second Year if she/he satisfies the conditions mentioned in Clause No. 11 of Direction No. 10 of 2019.

- a. Such a student will be required to take a casual admission to First year by paying Rs. Five Hundred only.
- b. Such a student will be required to fill the examination form for Sem I and Sem II and appear for the subjects required to be passed as per this Direction. This includes the equivalent subjects of old programme which he could not pass and the subject 'CSR and Sustainability', if she/he has not passed either 'Environment Management' or 'Business Ethics and Corporate Governance' as per old syllabus.
- c. The new mark list as per this Direction shall be generated for Sem I and Sem II wherein the marks of equivalent subjects (as mentioned in the table given hereunder) shall be mentioned.
- d. The marks for subject 'Business Communication and Information Systems' as per old programme shall be mentioned against two subjects i.e. 'Management Information Systems' and 'Managerial Skills for Effectiveness' as per this Direction.
- e. The marks for subject 'Research Methodology and Quantitative Techniques' as per old programme shall be mentioned against two subjects i.e. 'Business Statistics and Analytics for Decision Making' and 'Business Research' as per this Direction.
- f. The marks for 'Strategic Management' as per this Direction shall be mentioned if the student has passed 'Strategic Management' of MBA Sem III of old programme. If not, the student will have to appear for the same paper as per this Direction.
- g. Such a student will have to appear for Sem III examination as per this Direction. However, the student will be entitled to exemption for the subjects she/he had passed as per the old programme.

**III.** A student who has passed Semesters I, II and III examinations as per old programme in the given attempts and eligible for MBA Sem IV as per this Direction.

- a. Such a student will be required to take a casual admission to First year and Second year by paying Rs. Five Hundred only per semester.
- b. Such a student will be required to fill the examination form for Sem I, Sem II and Sem III and appear for the subjects required to be passed as per this Direction. This includes the subjects 'CSR and Sustainability' and 'Management Case Analysis' if she/he has not passed either 'Environment Management' or 'Business Ethics and Corporate Governance' as per old syllabus.
- c. The new mark list as per this Direction shall be generated for Sem I, Sem II and Sem III wherein the marks of equivalent subjects (as mentioned in the table given hereunder) shall be mentioned.

- d. The marks for subject 'Business Communication and Information Systems' as per old programme shall be mentioned against two subjects i.e. 'Management Information Systems' and 'Managerial Skills for Effectiveness' as per this Direction.
- e. The marks for subject 'Research Methodology and Quantitative Techniques' as per old course shall be mentioned against two subjects i.e. 'Business Statistics and Analytics for Decision Making' and 'Business Research' as per this Direction.
- f. If the student had opted for 'Service Sector Management' specialization as per old programme, she/he will be having a choice of selecting any other specialization offered in this Direction as the 'Service Sector Management' specialization is not offered in this Direction. However, if the student has passed Paper 1 or 2 or both of 'Service Sector Management' marks of the same shall be mentioned against same papers in new mark list.

**IV. Note on Specialization:** This direction does not offer 'Service Sector Management' specialization which was offered in old programme. Hence, a student will have a choice to select new specialization area. However, the student shall be exempted from the papers of specialization that she/he had passed as per old direction in the following manner:

| Specialization selected as per this Direction         | Service Sector Management<br>(Direction No. 22 of 017) | Status of Equivalence |
|---|--|-----------------------|
| Paper 1   | Paper 1  | Yes                   |
| Paper 2   | Paper 2  | Yes                   |
| Paper 3   | Paper 3  | Yes                   |
| Paper 4 (To be Compulsorily passed by such a student) | --   | No                    |

**V. MOOCs:** Every student who was admitted to old MBA programme (under Direction No. 22 of 2017) but could not pass all subjects in given attempts and is now absorbed in the scheme of examination as per this Direction is required to successfully complete TWO MOOCs from SWAYAM/NPTEL portal to become eligible for the award of degree. The guidelines provided under Clause 9 (a) of this Direction is applicable to all such students also.

**Table 1: List of Equivalent Subjects/Papers (Core)**

| Semester Examination under this Direction | Name of the Course under this Direction               | Semester Examination under Old Course (2016) | Name of the Course under Old Direction (2016)    | Status of Equivalence |
|---|---|--|--|-----------------------|
| I   | Managerial Economics                                  | I  | Managerial Economics                             | Yes                   |
|   | Management Information Systems                        | I  | Business Communication and Information Systems   | Yes                   |
|   | Managerial Skills for Effectiveness                   | I  | Business Communication and Information Systems   | Yes                   |
|   | Organizational Behaviour                              | I  | Principles of Management                         | Yes                   |
|   | Financial Reporting, Statements and Analysis          | I  | Accounting For Managers                          | Yes                   |
|   | Business Statistics and Analytics for Decision Making | I  | Research Methodology and Quantitative Techniques | Yes                   |
|   | Legal and Business Environment                        | I  | Business Laws                                    | Yes                   |
|   | Business Research                                     | I  | Research Methodology and Quantitative Techniques | Yes                   |
|   | Financial Management                                  | II   | Financial Management                             | Yes                   |
| II  | Marketing Management                                  | II   | Marketing Management                             | Yes                   |
|   | Human Resource Management                             | II   | Human Resource Management and                    | Yes                   |

|                          |                       |  |  |                  |
|--------------------------|-----------------------|--|--|------------------|
|                          |                       |  | Organizational Behaviour                 |                  |
| Operations Management    | II                    | Operations Management                    | Yes                                      |                  |
|                          | III                   | Project Management                       | Yes                                      |                  |
| International Business   | II                    | Economic Environment of Business         | Yes                                      |                  |
|                          | IV                    | International Business Management        | Yes                                      |                  |
| CSR and Sustainability   | III                   | Environment Management                   | Yes                                      |                  |
|                          | IV                    | Business Ethics and Corporate Governance | Yes                                      |                  |
| Cost Accounting          | II                    | Cost Accounting                          | Yes                                      |                  |
| Management Case Analysis |                       |  |  | NO               |
| III                      | Elective I - Paper 1  |  |  | Refer to Table 2 |
|                          | Elective I - Paper 2  |  |  |                  |
|                          | Elective I - Paper 3  |  |  |                  |
|                          | Elective II - Paper 1 |  |  |                  |
|                          | Elective II - Paper 2 |  |  |                  |
|                          | Elective II - Paper 3 |  |  |                  |
|                          | Strategic Management  | III                                      | Strategic Management                     | Yes              |
|                          |                       | IV                                       | Business Ethics and Corporate Governance | Yes              |
| IV                       | Elective I - Paper 4  |  |  | Refer to Table 2 |
|                          | Elective II - Paper 4 |  |  |                  |
|                          | MOOC 1                |  |  | NO               |
|                          | MOOC 2                |  |  | NO               |

**Table 2: List of Equivalent Elective/Specialization Papers**

| Elective / Specialization Group | Semester Exam under this Direction | Paper   | Name of the Course under this Direction                 | Semester Exam under old Direction | Name of the Course under old Direction                | Status of Equivalence |
|---------------------------------|------------------------------------|---------|---|-----------------------------------|---|-----------------------|
| Financial Management            | III                                | Paper 1 | Investment Analysis and Portfolio Management            | III                               | Security, Portfolio and Risk Management               | Yes                   |
|                                 | III                                | Paper 2 | Project Appraisal and Finance                           | III                               | Corporate Financial Management                        | Yes                   |
|                                 | III                                | Paper 3 | Financial Derivatives                                   | IV                                | Investment Environment & Wealth Management            | Yes                   |
|                                 | IV                                 | Paper 4 | Managing Banks and Financial Institutions               |                                   | Investment Environment & Wealth Management            | Yes                   |
| Marketing Management            | III                                | Paper 1 | Sales and Distribution Management                       | III                               | Sales and Distribution Management                     | Yes                   |
|                                 | III                                | Paper 2 | Digital and Social Media Marketing                      | III                               | Consumer Buying Behaviour                             | Yes                   |
|                                 | III                                | Paper 3 | Integrated Marketing Communication and Brand Management | IV                                | Integrated Marketing Communication & Brand Management | Yes                   |
|                                 | IV                                 | Paper 4 | Retail Sales Management and Services Marketing          |                                   |   | NO                    |
| Human Resource                  | III                                | Paper   | Manpower Planning,                                      | III                               | Training & Development                                | Yes                   |

|                       |     |         |                                      |     |   |     |
|-----------------------|-----|---------|--------------------------------------|-----|---|-----|
| Management            |     | Paper 1 | Recruitment and Selection            |     | Human Practices                         |     |
|                       | III | Paper 2 | Performance Management System        | III | Performance and Compensation Management | Yes |
|                       | III | Paper 3 | Compensation and Benefits Management | III | Performance & Compensation Management   | Yes |
|                       | IV  | Paper 4 | Team Dynamics                        | IV  | Industrial relations & Labour Laws      | Yes |
| Operations Management | III | Paper 1 | Logistics & Supply Chain Management  | III | Logistics & Supply Chain Management     | Yes |
|                       | III | Paper 2 | Quality Toolkit for Managers         | IV  | Total Quality Management                | Yes |
|                       | III | Paper 3 | Operations Research                  | III | Operations Research                     | Yes |
|                       | IV  | Paper 4 | Sales and Operations Planning        |     |   |     |
| Business Analytics    | III | Paper 1 | Data Visualization for Managers      |     |   |     |
|                       | III | Paper 2 | Data Mining                          |     |   |     |
|                       | III | Paper 3 | Data Science using R                 |     |   |     |
|                       | IV  | Paper 4 | WEB and Social Media Analytics       |     |   |     |

|                              |     |         |   |  |  |  |
|------------------------------|-----|---------|---|--|--|--|
| Entrepreneurship Development | III | Paper 1 | Entrepreneurial Theory and Practices    |  |  |  |
|                              | III | Paper 2 | Business Plan Formulation               |  |  |  |
|                              | III | Paper 3 | Social Entrepreneurship                 |  |  |  |
|                              | IV  | Paper 4 | Entrepreneurial Marketing               |  |  |  |
| International Business       | III | Paper 1 | International Marketing Management      |  |  |  |
|                              | III | Paper 2 | Export Documentation and Procedures     |  |  |  |
|                              | III | Paper 3 | International Finance                   |  |  |  |
|                              | IV  | Paper 4 | International Human Resource Management |  |  |  |

- g. The above absorption scheme of M.B.A. shall be effective till the introduction of new Syllabus with new absorption scheme.

## 26. Guidelines for Project Work :

### Objective:-

Every student will be assigned a project in 4<sup>th</sup> Semester and it will be pursued by him/her under the supervision of an internal supervisor. The objective of the Project Work is to help the student develop his/her ability to apply multi-disciplinary concepts, tools and techniques to solve organizational problems and/or to evolve new/innovative theoretical frame work.

### Types of Project:

The Project may take any one of the following forms:

- i) Comprehensive case study (covering single organization/multifunctional area problem, formulation, analysis and recommendations)

- ii) Inter-organisational study aimed at inter-organisational comparison/validation of theory/survey of management services.
- iii) Evolution of any new conceptual / theoretical framework.
- iv) Business Plan/Viability Studies
- v) Field study (Empirical study).
- vi) Software analysis, Design and solutions for organisational achievement (Applicable to IT)

### **Selection of Project Topic:-**

- Project topic has to be selected with respect to the programme of study and area elected by the student.
- Title of the project should clearly specify the objective and scope of the study. It should be specific and neither too vague nor centralistic. The topics should be designed meticulously. It can be designed like "Employee Welfare Measures" – A case study of XYZ Ltd.
- Project selection has to be made in consultation with the supervisor who will act as a Project guide for the student.

### **Scope of Work:-**

The student is expected to carry out following activities in the project:

1. Prepare a synopsis and get it approved by the supervisor as assigned by the respective Institutes. Approved synopsis shall be part of final report as appendix.
2. Undertake a detailed literature survey on the subject matter.
3. Make relevant data collection/observation.
4. Consult experts of the field.
5. Visit related organizations/institutions/industries.
6. Compile data in proper format.
7. Make proper conclusion/recommendations.
8. Prepare a Project Report.
9. The volume of the project-report should be ranging from 60-80 pages.
10. Obtain approval of Project Report by project supervisor.
11. Submit a hard bound copy of the Project Report at the Institute.
12. Submission of the Project Report shall be one month prior to the date of the commencement of the 4<sup>th</sup> Semester Examinations for MBA.

### **General Format of the Report:-**

The project report should preferably be written in the following format:

- a) Executive Summary
- b) Introduction to topic
- c) Research Methodology
- d) Analysis and Findings of the study
- e) Conclusions and Recommendations of the study
- f) Bibliography

g) Appendices - to include questionnaire, if any

**Examination and Evaluation:-**

The Project is to be treated as a Course of study of the MBA-4<sup>th</sup> Semester comprising of 100 marks. The external assessment shall be done on the basis of the project report and Viva Voce. The Project shall be evaluated by an External faculty for 50 marks and by the Supervisor (Internal examiner) for 50 marks. The Project work shall be evaluated by internal and external examiners approved in the list of the University for 100 marks (as mentioned above) at the respective institute/college/department as per the schedule fixed by the university. No External Examiner shall be allow to examine/evaluate the project of more than 20 students in any academic year.

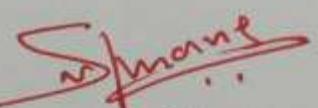
27. Industrial Tour:-

Industrial Tour: To make students understand the various aspects of business; college/Institute/Department may organize industrial visits to the industrial/business houses.

28. This direction shall come into force in a phase wise from the academic session 2019-20.

29. With the issuance of this Direction all the earlier Directions, if in existence,, shall stand repealed.

30. Notwithstanding the repeal of earlier directions by this directions any action taken by the university in pursuance of and in furtherance of those directions shall be valid and binding on all the persons.

  
(Dr. Siddharthavinyaka P. Kane)  
Vice-Chancellor

Nagpur,

Dated: 8/8/2019

**Faculty of Science and Technology**  
**R.T.M Nagpur University, Nagpur**  
**Syllabus for B. Tech. First Semester**

**Mathematics – I**

**Total Credits: 4**

**Teaching Scheme**

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

**Subject Code: BES1-1**

**Examination Scheme**

Theory T (U): 70 Marks, T (I): 30 Marks

Duration of University Exam: 3 hours

**Course Objectives:**

1. The topics covered will equip them the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power.
2. The aim is to inculcate and develop the basic mathematics skills of engineering students that are imperative for effective understanding of engineering subjects.

**Course Outcomes:**

After completing the course, students will be able to

1. Analyze real world scenarios to recognize when derivatives or integrals are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
2. Appreciate ODE and system of ODEs concepts that are encountered in the real world, understand and be able to communicate the underlying mathematics involved to help another person gain insight into the situation.
3. Apply knowledge of mathematics, physics and modern computing tools to scientific and engineering problems.
4. Develop an ability to identify, formulate and/or solve real world problems.
5. Understand the impact of scientific and engineering solutions in a global and societal context.

**Unit 1: Differential Calculus**

**(8 Hours)**

Successive differentiation: Leibnitz's Rule, Taylor's and Maclaurin's series for function of one variable, Indeterminate forms and L'Hospital's Rule, Maxima and Minima for function of one variable.

**Unit 2: Multivariable Calculus (Differentiation)**

**(12 Hours)**

Functions of several variables, First and Higher order partial derivatives, Euler's theorem, Chain rule and Total differential coefficient, Jacobians, Taylor's and Maclaurin's series for function of two variables, Maxima and Minima for function of two variables, Lagrange's method of undetermined multipliers.

**Unit 3: Matrices**

**(8 Hours)**

Inverse of a matrix by Partitioning method, Rank of a matrix, Consistency of linear system of non-homogeneous equations, Homogeneous system of Linear equations, Symmetric, Skew-symmetric and Orthogonal matrices, Linear and Orthogonal transformations, Cayley-Hamilton theorem.

**Unit 4: First Order Ordinary Differential Equations (8 Hours)**

Linear, Reducible to linear and Bernoulli's differential equations, Exact differential equations (excluding the cases of integrating factors), Equations of first order and higher degree: Solvable for p, Solvable for y, Solvable for x and Clairaut's type, Application of first order differential equation to simple electrical circuits.

**Unit 5: Higher Order Ordinary Differential Equations (12 Hours)**

Higher order ordinary linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations, Simultaneous differential equations, Equations of the type  $d^2y/dx^2=f(x)$  and  $d^2y/dx^2=f(y)$ , Applications of higher order differential equations to simple electrical circuits.

**Text/Reference Books:**

- (1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- (2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
- (3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- (4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- (5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
- (6) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

## **B. Tech. Semester I Applied Physics (Total Credits: 4)**

| <b>Teaching Scheme</b>              | <b>Examination Scheme</b>                     |
|-------------------------------------|---|
| <b>Lectures: 3hr/Week,</b>          | <b>T (U): 70 Marks T (I): 30 Marks</b>        |
| <b>Activity/Tutorial: 2 hr/Week</b> | <b>Duration of University Exam. : 3 Hours</b> |

### **Unit 1: Wave optics (09 Hours) 14 Marks**

Huygen's principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting, Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating.

Fraunhofer diffraction from a single slit and a circular aperture, Diffraction grating and its resolving power.

### **Unit 2: Quantum Mechanics (10Hours) 14 Marks**

Planck's Hypothesis, Properties of Photons, Compton Effect: Equations for energy and momentum conservation, Expression for Compton shift & its interpretation. Concept of wave-particle duality, de-Broglie Hypothesis, Matter Waves, Davisson-Germer Experiment; Bohr's Quantization condition.

Wave function  $\Psi$  and normalization condition, concept of wave packets, Heisenberg Uncertainty Principle. Schrodinger wave equation (time dependent and time independent), Application to one dimensional infinite potential well.

### **Unit 3: Crystal Structure (08 Hours) 14 Marks**

Crystal structure, Meaning of lattice and basis, Unit cell: primitive and non primitive unit cell; Cubic crystal structure: Simple, Body and Face centered cubic structures, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, nearest neighbor distance, coordination number, atomic packing fraction, void space, density.

Crystal planes and Miller indices, Inter-planar distance and its co-relation with Miller indices and lattice parameter , Bragg's law of X-ray diffraction.

### **Unit 4: Optical Fiber (08 Hours) 14 Marks**

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.

Light sources and Detectors, Applications of optical fiber as Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor, Fiber optic communication system.

## **Unit 5: Electron Optics (07 Hours) 14 Marks**

Basic idea of motion of charged particle in electric and magnetic fields, Velocity selector, Bethe's law of electron refraction, electric focusing, Construction & working of Electrostatic lens.

Devices: Cathode Ray Tube, Cathode Ray Oscilloscope and its applications, Block Diagram, Function & working of each block, Bainbridge mass spectrograph.

### **Course Outcomes**

Students will be able to

**CO1.** Apply concepts in interference and diffraction to solve relevant numerical problems and to relate to relevant engineering applications

**CO2.** Learn the basic concepts of dual nature of matter and wave packet and apply them to analyze various relevant phenomena and to solve related numerical problems

**CO3.** Recall the basic concepts of crystal structure and apply them in solving numerical problems based on them and in relating to applications for determination of crystal structure.

**CO4.** Relate the basic idea of total internal reflection to the propagation of light in an optical fiber and make use of the fiber concepts to solve numerical problems and relate to applications in engineering

**CO5.** Find how to extend the basic concepts of motion of charged particles in electric magnetic fields to solve numerical problems and to relate to applications in electron optic devices and CRO

### **List of activities**

1. Compilation of information regarding interference in day to day life.
2. Comparative study of interference pattern of Newton's ring using Plano convex lens of different radii.
3. Comparison of diffraction patterns of various obstacles such as razor, coin, knife, etc.
4. Biography of Compton & de-Broglie in any electronic form (ppt./video).
5. Understanding the concept of micro and macro bodies, its identification and phenomenon observable using it with reason.
6. Justification of Heisenberg's Uncertainty Principle using thought experiment.
7. Applications of Heisenberg's Uncertainty Principle to prove electron does not exist in the nucleus.
8. Model making such as voids, planes, Miller Indices, FCC, BCC and SC.
9. Exhibition of variety of crystals in nature or day to day life.
10. Tyndall's demonstration.
11. Total Internal Reflection with the help of glass of water & laser source.
12. Collection of optical fibres to understand the internal structure.
13. Determination of ' $\lambda$ ' for various types of waves using CRO. (square, rectangular, sinusoidal)
14. Verification of  $v = \frac{E}{B}$  using Thomson's experiment.

**Note : Performance of at least one activities is compulsory in a semester.**

## **Modes of Conducting/ Performing the activities**

1. Quiz
2. Demonstration
3. Seminar
4. Group discussion
5. Assignment
6. Study of business model
7. Case study
8. Model making
9. Industry/research lab visit
10. Technical or research paper writing (for conference)
11. PPT making (Power Point Presentation)
12. Mini project

## **Suggested Text Books &Reference Books**

1. *P. M. Mathews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata Mc Graw Hill (1977).*
2. *J. L. Powell and B. Crasemann, Quantum Mechanics, Narosa Publishing House (1993).*
3. *Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition, (1983).*
4. *A. J. Dekker, Solid State Physics, Prentice Hall of India (1971).*
5. *A Textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication*
6. *Text book of Applied Physics, Dr. D. S. Hardas, Dr. D. S. Bhoumik, Dr.S. Shastri, Das Ganu Publication ISBN-978-93-84336-59-2 (2021)*
7. *Applied Physics, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. CHAND*
8. *A Text Book of Engineering Physics Dr. Devashree Hardas & Dr. Ashish Panat, Das Ganu Publication ISBN-978-81-921757-7-5 (2011)*
9. *Applied Physics, - Dr. (Mrs)S.P. Wankhede, Dr.Shruti Patle, Dr.(Mrs.)S.U.Bhonsule and Dr.N. S. Ugemuge DNA Publication ISBN-978-81-945174-6-7 (2020)*
10. *Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles by R. Eisberg and R. Resnick, Wiley and Sons*
11. *Engineering Physics, second edition, Sanjay Jain, G. Sahasrabudhe, University's Press(India) Pvt. Ltd.(2016)*
12. *D. J. Griffiths, Quantum mechanics, Prentice Hall of India Private Limited, New Delhi*
13. *L. I. Schiff, Quantum Mechanics, TMH Publications*
14. *David Halliday, Robert Resnick, Jearl Walker, Principles of Physics, 10<sup>th</sup> Edition, John Wiley and Sons (2017)*
15. *Advanced physics - Dr.Shruti Patle, Dr.(Mrs).S.U.Bhonsule, Dr.Ashish N. Bodhaye, Dr.Manohar D.Mehare DNA Publication (2019)*
16. *Engineering Physics - Dr.N. S. Ugemuge, Dr.(Mrs.)S.U.Bhonsule and Dr.Shruti Patle DNA Publication(2019)*

## **B. Tech. Semester I Applied Physics (Practical) (Total Credits: 1.5)**

| <b>Teaching Scheme</b>     | <b>Examination Scheme</b>              |
|----------------------------|--|
| <b>Lectures: 3hrs/Week</b> | <b>P (I): 25 Marks P (U): 25 Marks</b> |

### **List of Experiments**

1. Interference in thin films: Study of wedge shaped thin film.
2. Radius of curvature of a plano convex lens by Newton's Rings
3. Diffraction due to plane diffraction Grating
4. Determination of principal refractive indices of a prism
5. Determination of Plank's constant by using LEDs.
6. Comparative study of cubic crystal structure (with the help of model)
7. Determination of NA for optical fiber
8. Determination of  $e/m$  of an electron by bar magnet method (Thomson's method)
9. Calibration of Time Base circuit of CRO and determination of frequency of electrical signals
10. Determination of phase of electrical signals using CRO.
11. Determination of AC and DC voltage using CRO.

**Note:** Performance of at least **six** experiments is compulsory in a semester.

## **Scope of the syllabus**

### **B. E. Semester I**

### **Applied Physics**

#### **Unit One: Wave Optics**

Interference in thin films, Interference in wedge shape thin film, characteristics of Newton's rings, Antireflection coating, phase and amplitude condition, derivation of minimum thickness, Advanced applications of interference in thin film, Concept of diffraction, Expression of resolving power of grating.

#### **Unit Two: Quantum Mechanics**

Equations for energy and momentum conservation, Mathematical equation for Compton shift & its interpretation (without derivation). Relative intensities of modified and unmodified wavelengths for high and low atomic number scatterers and its explanation, Free electron cannot absorb a photon (proof), Concept of wave particle duality, Matter waves and de-Broglie relation, Significance of matter waves in microscopic and macroscopic bodies.

Definition of wave function ( $\Psi$ ), Heisenberg Uncertainty Principle; significance and applications, Schrodinger's time dependent and time independent wave equations (only equations), Application of Schrodinger's time independent equation to infinite potential well.

#### **Unit Three: Crystal Structure**

Central idea of periodic spatial arrangement of atoms and molecules, derivation of inter planer spacing and Bragg's Law, Applications of Bragg's Law.

#### **Unit Four: Optical Fibers**

Mechanism of attenuation: Attenuation versus wavelength plot, optical window, outline of mechanism of dispersion, Introduction to light source and detectors.

#### **Unit Five: Electron Optics**

Concept of motion of charged particle in electric and magnetic fields with expression of force, Velocity selector, Bethe's law of electron refraction, electric focusing, Construction & working of Electrostatic lens.

Devices: Cathode Ray Tube, Cathode Ray Oscilloscope and its applications, Block Diagram, Function & working of each block, Bainbridge mass spectrograph.

Cathode ray oscilloscope, Block diagram of CRO, Role of each block, Cathode Ray Tube, Various parts of CRT, Applications of CRO: 1) Measurement of AC voltage, 2) Measurement of DC voltage, 3) Determination of frequency, 4) Phase measurement.

**RTMNU, Nagpur**  
**SYLLABUS FOR FIRST YEAR (SEMESTER I & II) BACHELOR OF TECHNOLOGY**  
**(For All Branches)**

|                             |                               |            |                |                       |
|-----------------------------|-------------------------------|------------|----------------|-----------------------|
| <b>Course Code</b>          | BESI-3T                       |            |                |                       |
| <b>Course Title</b>         | <b>Energy and Environment</b> |            |                |                       |
| <b>Scheme &amp; Credits</b> | <b>L</b>                      | <b>T/A</b> | <b>Credits</b> | <b>Semester<br/>I</b> |
|                             | <b>2</b>                      | <b>2</b>   | <b>3</b>       |                       |

| <b>Examination Scheme</b>         |   |
|-----------------------------------|---|
| T (U) : 70 Marks T (I) : 30 Marks | Duration of University Exam. : 03 Hours |

**Course objectives**

1. To impart knowledge in the domain of renewable and non-renewable energy sources.
2. To bring out Impact of Energy Technologies on Environment
3. To inculcate knowledge and skills about assessing the energy efficiency of different energy sources and use of advanced materials for sustainable development.

**Course outcomes**

After studying the course it is expected that the students will have/be able to:

- CO-1 Obtain the knowledge of solid and gaseous fuels and their Calorific Value determination.
- CO-2 Recognize the type of liquid fuels and their uses in IC engines.
- CO-3 Apply the knowledge about the use of alternative sources of energy& utilize solid waste as energy source
- CO-4 Analyze the impacts of Industrial pollution and its control.
- CO-5 Develop innovative ideas for use of advanced materials in sustainable development.

**UNIT 1:- Basics of Energy and Solid Fuels**

**(8 Hours) (Marks 14)**

- Basics of Energy - Introduction, sources and types of energy, Units of energy, Thermal Basics of energy -fuels, thermal energy contents of fuel, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer.
- Classification of fuels, Calorific Value (HCV & LCV). Determination of Calorific value by Bomb and Boy's Calorimeter.
- Solid Fuels:- Significance of Proximate and Ultimate Analysis of coal,
- Numerical based on Dulong's formula.
- Numerical on Goutal's Formula for Gross Calorific Value based on Proximate Analysis
- Numerical on Calorific Value determination.
- Numerical on GCV & NCV by using relation formula (convert answer in joules or one of the CV given in joules)

**UNIT 2: Liquid and Gaseous Fuels**

**(8 Hours) (Marks 14)**

- Liquid Fuel:-Fractional distillation of crude oil, Catalytic cracking and its advantages
- Knocking in internal combustion petrol and diesel engine, Octane and Cetane number, Knocking and its relationship with structure of fuel, Doping agents,
- Power alcohol, Gasohol, Diesehol, Aviation fuel, Bio-diesel.
- Gaseous Fuel:-CNG, H<sub>2</sub> as specialised fuel
- Combustion Calculations.

### **UNIT 3:- Alternate Sources of Energy & Waste to Energy Conversion**

**(8 hours) (Marks 14)**

- Bio-energy, Photolysis of water- Chemical Conversion of Solar Energy.
- Nuclear fuels: Numerical on Binding Energy & Average Binding Energy per Nucleon
- Fuel cells- working, advantages and disadvantages of alkaline, methanol fuel cells.
- Classification of waste on the basis of segregation at source, hazardous solid waste management technology:Physical method, chemical method, biological treatment, Eco-friendly Incineration, Depolymerization,landfill techniques.
- Utilization of Biogas and Landfill Gas for Biofuels and High Value Chemicals, gasification and Utilization of Syngas, Thermochemical Conversion of Syngas

### **UNIT 4:- Environmental impacts of Energy Technologies**

**(8 Hours) (14 Marks)**

- Industrial pollution due to non-renewable energy sources: General Introduction of Industrial pollution and its types. Principle, processes, source of pollution.
- Environmental impact and its control with reference to specific industries; like Nitrogen containing fertilizers- ammonia synthesis, Cement manufacturing Industry; Sulfuric acid manufacturing industry and petroleum Industry

### **UNIT 5:- Advanced materials for sustainable development**

**(8 Hours) (14 Marks)**

- Introduction of Advance materials, properties and applications:- composites, liquid Crystal polymers, conducting polymers, insulating materials, adhesives, biodegradable polymers.
- Nanomaterials in energy- Photochemical devices like lithium ion batteries, Nanomaterials for Energy Storage, nanomaterials in solar cells.

#### **Books Recommended:**

1. Text Book of Engineering Chemistry: S.S. Dara, S. Chand and Company Ltd. New Delhi.
2. Textbook of Engineering Chemistry: P.C. Jain and Monica Jain, DhanpatRai and Sons, New Delhi.
3. Materials Chemistry: A.V. Bharati and Walekar, Tech Max Publications, Pune.
4. Energy and Environment: Archana R Chaudhari and Aditi Pandet, S. Chand Publication

#### **Reference Books:**

1. A Text book of Engineering Chemistry:Shashi Chawla; DhanpatRai& Sons, New Delhi.
2. Applied Chemistry by N. Krishnamurthy: P. Vallinavagam. And K. Jeysubramanian TMH
3. Applied Chemistry for Engineers: T.S. Gynell.
4. Fuels and Combustion: Amir Circar, Orient Longmans
5. Fundamentals of Engineering Chemistry (Theory and Practice) :S. K. Singh (New Age Materials)
6. Environmental Chemistry: B. K. Sharma
7. Industrial Energy Management and Utilization: L.C. Witte, P.S. Schmidt and D.R. Brown (Hemisphere Publishing Corporation, Washington,1998
8. Energy and Environment- NPTEL lecture notes

## **ENERGY AND ENVIRONMENT LABORATORY (BESI-3P)**

|                             |                                   |          |          |                |                 |
|-----------------------------|-----------------------------------|----------|----------|----------------|-----------------|
| <b>Course Code</b>          | <b>BESI-3P</b>                    |          |          |                |                 |
| <b>Course Title</b>         | <b>Energy and Environment Lab</b> |          |          |                |                 |
| <b>Scheme &amp; Credits</b> | <b>L</b>                          | <b>T</b> | <b>P</b> | <b>Credits</b> | <b>Semester</b> |
|                             | <b>0</b>                          | <b>0</b> | <b>2</b> | <b>1</b>       | <b>I</b>        |

| <b>Examination Scheme</b>                |  |
|--|--|
| <b>P (U) : 25 Marks P (I) : 25 Marks</b> | <b>Duration of University Exam. : 03 Hours</b> |

### **Laboratory outcomes**

After completion of this course, the student will develop competencies in

1. The practical knowledge of handling chemicals.
2. Analysing a broad foundation in energy and environment that stresses scientific reasoning and analytical problem solving with a molecular perspective.
3. Experimental techniques using modern instrumentation.

### **Students should-**

- **Perform any six experiments.**
- **Study of any one experiment in virtual lab topics based on the syllabus.**
- **Study of any one demonstration experiment.**

- 1) Determination of Flash Point of the given sample by Cleveland's open cup apparatus.
- 2) Determination of Flash Point of the given sample by Abels/ Pensky Martens close cup apparatus.
- 3) Determination of Neutralisation number (Acid value) of oil.
- 4) Determination of Viscosity by Redwood Viscometer and specific gravity of Biodiesel at different temperatures.
- 5) To determine Sulphate Concentration in a given water sample.
- 6) Determination of amount of Chloride (in Cl<sup>-</sup> form) by Mohr's method.
- 7) Determination of COD of water sample.
- 8) To determine the Total Solids, Suspended Solids and Total Dissolved Solids of a given water sample.
- 9) Determination of turbidity of given water sample by Nephelometry
- 10). Proximate analysis of coal -Determination of % of Moisture and % of Volatile Matter in coal sample
- 11) Proximate analysis of coal -Determination of % of ash in coal sample
- 12) Demonstration of determination of % carbon by Carbon residue conradson apparatus.
- 13) Demonstration of determination of Consistency of grease by Penetrometer.
- 14) Demonstration (Virtual) of determination of Calorific value of solid/liquid fuels.
- 15) Demonstration (Virtual) of estimation of flue gas by Orsat's apparatus.

### **Activities**

1. Preparation of Audit Report for Industry waste generation.
2. Survey of greener synthesis of common drugs ( in the form of chart and/or model)
3. Nearby industrial chemicals safety measures
4. Study of Chemical processes involved in nearby industries (Cement, Paper, Electroplating, Water purification industry etc.)
5. Study of separation and recycling techniques of polymers and E-waste.
6. Study of Biogas plant.
7. Study of the production process of biofuels.
8. Study of the biomass briquetting machine.

## Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

### **Subject: Communication Skills**

Total Credits:02

Sub.Code: BSCE1-4T

2020-21, Semester: I

Teaching Scheme

Lectures: 2 Hours/ Week (Theory)

Examination Scheme

T (U) : 35 Marks T (I) : 15 Marks

Duration of University Exam. : 02 Hours

**Course Objective:** To enhance competency in English language among learners.

Course Outcomes:

1. Students will be able to overcome barriers of communication.
2. Students will acquire public speaking skills and handle group situations professionally.
3. Students will be able to comprehend passages and compose paragraphs.
4. Students will be able to construct error free and meaningful sentences in English.

Dr. M.N. Giriya (Dr. Sajid Anwar)

B.R. Chide

Abhilash Bhatia

### Syllabus of Communication Skills (Theory)

**Unit 1:A.** Introduction to Communication, Importance of Communication, Process of Communication, Types of communication- Verbal and Non Verbal  
**B.** Oral and Written Communication, Barriers to Communication and methods to overcome them. (6 hours)

**Unit 2:** A. Listening Skills, Importance of Listening, Types of Listening, Listening Barriers and methods to overcome them .

B. Effective Speaking Skills, Components of Public Speaking, Overcoming stage fear in public speaking, Group Discussion-Process and techniques (6 hours)

**Unit 3:A.** Reading Skills, Importance of Reading, Sources of Reading, Skimming, Scanning,

Comprehending passage

**B.** Writing Skills, Process and Techniques of Composition-Précis, Paragraph, Essay (6 hours)

**Unit 4:A.** Basic Grammar: Tenses and its types, Sentences and its types

**B.** Transformation of Sentences- Assertive-Imperative-Interrogative-Exclamatory, Reported Speech.(6 hours)

### Books Recommended:

1. Technical Communication by Meenakshi Raman and Sangeeta Sharma, OUP
2. Public Speaking and Influencing Men in Business by Dale Carnegie
3. Essentials of English Grammar by Micheal Swan
4. Professional Communication Skills by Bhatia and Sheikh
5. Business Communication by K.K. Sinha
6. Communication Skills by Dr. P. Prasad
7. Communication Skills by Sanjeev Kumar and Pushpalata, OUP

B. Agrawal  
 (Dr Bhavneeta Dgrawal)

Doralf  
 (Dr. Dora Thompson)

(Dr Nawaz Khan)

Ahmed  
 (Dr. Sajid Ahmed)

DR  
 (B.R. Chide)

Geejje  
 Dr m.n. Giniyo

Abhita  
 AR Bhoradi

**Subject: Communication Skills**

Total Credits:01

2020-21, Semester: I

Sub.Code : BSE1 - 4P

Teaching Scheme

Examination Scheme

Practical : 2 Hours/ Week Practical

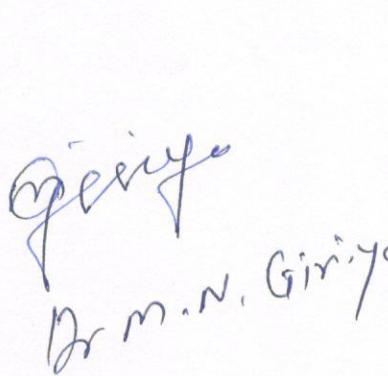
P (U) : 25 Marks P(I) : 25 Marks

Duration of University Exam. : 03 Hours

Course Objective: To enhance competency in all the four skills (LSRW) of English language among learners.

## Course Outcomes:

1. Students will be able to overcome listening barriers of communication.
2. Students will be able to enhance their comprehending skills and speaking skills.
3. Students will be able to give effective presentations and handle group situations professionally
4. Students will be able to use figurative language in their formal as well as informal communication.

  
 Dr. M. N. Giridhar  
 (Dr. Sajid Anwar)  
 (B. R. Chide)

## Syllabus of Communication Skills (Practical)

1. Barriers to Communication- Overcoming listening barriers
2. Non-verbal Communication
3. Reading Skills
4. Speaking Skills
5. Presentation Skills
6. Group Discussion
7. Interview Techniques
8. Use of Figurative Language

B. Agrawal  
 (Dr. Bhumiika Agrawal)

Doralf  
 (Dr. Dora Thompson)

Nawaz  
 (Dr. Nawaz Khan)

Ahmed  
 (Dr. Sajid Ahmed)

Girija  
 Dr. M. N. Girija

Abdul  
 (Dr. Abdul Bhatia)

(B.R. Chide)

**RTM Nagpur University**  
**Syllabus (Theory)**

| <b>Semester</b> | <b>Course Title<br/>(Subject)<br/>Code:<br/>BSE1-5T</b> | <b>Hours / Week</b> |          |          | <b>Credits</b> | <b>Maximum Marks</b>                      |   |              | <b>Exam<br/>Duration<br/>(Hrs.)</b> |
|-----------------|---|---------------------|----------|----------|----------------|---|---|--------------|-------------------------------------|
|                 |   | <b>L</b>            | <b>T</b> | <b>P</b> |                | <b>Continu<br/>al<br/>Assessm<br/>ent</b> | <b>Univers<br/>ity<br/>Examin<br/>ation</b> | <b>Total</b> |                                     |
| B.E. I Sem      | Engineering Graphics                                    | 1                   |          |          | 1              | 15  | 35  | 50           | 03                                  |

|                    |  |
|--------------------|--|
| <b>Sr.<br/>No.</b> | <b>Course Objective</b><br><b>The objective of this course is–</b>   |
| 1                  | To acquire basic knowledge about engineering drawing language, line types, dimension methods, and simple geometrical construction. To draw conic sections by various methods, involutes, cycloid and spiral. |
| 2                  | To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views. To imagine visualization of lateral development of solids.                       |
| 3                  | To visualize three dimensional engineering objects and shall be able to draw their isometric views   |

**Course Outcomes**

After successful completion of this course the student will be able to:

|            |  |
|------------|--|
| <b>CO1</b> | The learner will able to understand the basic knowledge of engineering graphics such as instruments, lines, dimensioning techniques, scales, sheet layout. Construct the various engineering curves using the drawing instruments and basic of orthographic projection through drawing the projection of point and line. |
| <b>CO2</b> | The learner will able to understand projections of different types planes (2D) and solids (3D) and will be able to draw different views of plane and solids.   |
| <b>CO3</b> | The learner will able to understand concept of sectioning and development of lateral surfaces of solid and will able to represent it.  |
| <b>CO4</b> | Apply the visualization skill to draw a simple isometric projection/view from given orthographic views precisely using drawing equipment   |

| <b>SYLLABUS</b>   |             |  |
|---|-------------|--|
| Contents  | No of hours |  |
| <b>Unit I:</b><br><b>Introduction to Engineering Graphics:</b> Introduction to Engineering Graphics, Use of various drawing instruments, Sizes of drawing sheets, different types of lines used in drawing practice. Dimensioning linear, angular, aligned system, unidirectional system, Introduction to scales & scale factor (RF). | 3           |  |
| <b>Basics of Orthographic Projections:</b> Basic principles of orthographic projection, reference planes, concepts of four quadrants, methods of orthographic projections. First angle projections,   |             |  |

Girija  
 Dr. Sajid Arora  
 (Dr. Sajid Arora) RR  
 (R.R.Chide)

**Projections of Points and Lines:** Projections of points in all possible positions w.r.t reference planes. Projections of lines when it is perpendicular to one of the reference planes, when line is inclined to one & parallel to other reference plane. Lines inclined to both reference planes. (Lines in First Quadrant Only)  
**Construction of conic section by using various methods.** Ellipse, Parabola and Hyperbola,  
**Engineering Curves:** Cycloid, Involute, Archimedean Spiral.

3

**Unit II:**

**Projection of planes:** Types of planes, position of planes parallel to one of the reference planes, Perpendicular to one & inclined to other reference plane. Inclined to both reference planes. Types of Auxiliary Planes, projection on auxiliary planes, (Exclude determination of true shape).

**Projection of Solids:** types of solids, Simple positions, Axis inclined to one plane & parallel to other plane(only two stage)

3

**Unit III:**

**Section of Solids.** (only one stage)– Types of section plane, types of sectional views, true shape of section. Projection of different solids cut by different section plane(when solid is in simple position, i.e. axis perpendicular to one and parallel to other reference plane).

**Development of Lateral Surfaces:** Principle of development, methods of development of lateral surfaces of solids. Development of lateral surface of above cut solids.

3

**Unit IV:**

**Isometric View and Projection:** Definition of isometric projection/view, Isometric scale, isometric lines, planes, non isometric lines/plane. Plane figures. Construction of isometric view from given views of an object. Construction of isometric projection of combined solids ( axes vertical and coinciding) Prism, Pyramid Cylinder and Cone.(Exclude Sphere)

Total

12

| Sr. No. | List of Tutorials  | No of hours |
|---------|--|-------------|
| 01      | Projection of points.  | 1           |
| 02      | Projection of Straight lines – Simple positions, Minimum 4 problems on Projection of Straight lines: Inclined to both the planes.. | 2           |
| 03      | Two problem each of Construction of conic section by using various methods. Ellipse, Parabola and Hyperbola,                       | 2           |
| 04      | One problem each of Cycloid, Involute, Archimedean Spiral.   | 1           |
| 05      | Projection of planes – Perpendicular and oblique planes  | 2           |
| 06      | Projection on auxiliary planes   | 2           |
| 07      | Projection of Solids : Simple positions, Axis inclined to one plane & parallel to other  | 2           |
| 08      | Section of Solids – Prism & Pyramids ,Cylinder & Cones<br>Development of Lateral Surfaces – Prism, Pyramid, Cylinder & Cones       | 6           |
| 09      | Isometric View and Projection – Planes or plane figures ,Prism, Pyramid Cylinder and Cone, General Object                          | 6           |
|         | Total no of Tutorial   | 24          |

gisiye  
Dr. M. N. Gargya  
*Ashutosh (A. V. Bhagat)*  
*Ahmed*

DR  
*R.R. Chidie*

**References:****Text Books Recommended:**

Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India

Dhawan, R. K., (2000), "A Textbook Of Engineering Drawing", S. Chand, New Delhi

**Reference Books Recommended:**

Jolhe, D. A., (2015), "Engineering Drawing ", Tata McGraw Hill, New Delhi

Shah P J, (2012) 'Basics of Engineering Graphics' S. Chand, New Delhi

P.S. Gill , (2015) "Engineering Drawing", S.K.Kataria and sons,

**RTM Nagpur University  
Proposed Syllabus (Practical)**

| Semester   | Course Title<br>(Subject)<br><i>Code :<br/>DSE1-5P</i> | Hours / Week |   |   | Cr<br>edi<br>ts | Maximum Marks                   |                                   |       | Exam<br>Durati<br>on<br>(Hrs.) |
|------------|--|--------------|---|---|-----------------|---------------------------------|-----------------------------------|-------|--------------------------------|
|            |  | L            | T | P |                 | Contin<br>ual<br>Assess<br>ment | Unive<br>rsity<br>Exami<br>nation | Total |                                |
| B.E. I Sem | Engineering<br>Graphics lab                            | -            | - | 4 | 2               | 25                              | 25                                | 50    |                                |

|            |  |
|------------|--|
| Sr.<br>No. | <b>Course Objective</b><br>The objective of this course is-  |
| 1          | To acquire basic knowledge about engineering drawing , line types, dimension methods, and simple geometrical construction. To draw conic sections by various methods, involutes, cycloid and spiral. |
| 2          | To acquire basic knowledge about physical realization of engineering objects and shall be able to draw its different views. To imagine visualization of lateral development of solids.               |
| 3          | To visualize three dimensional engineering objects and shall be able to draw their isometric views   |

**Course Outcomes**

After successful completion of this course the student will be able to:

|     |  |
|-----|--|
| CO1 | Draw the fundamental engineering objects using basic rules and able to construct the lines, simple geometries. Construct the various engineering curves using the drawing instruments. |
| CO2 | Draw two dimensional and three dimensional objects. precisely using drawing equipment.   |
| CO3 | Draw the development of lateral surfaces for cut section of geometrical solids precisely using drawing equipment.  |
| CO4 | Draw a simple isometric projection from given orthographic views precisely using drawing equipment.  |

*Giriy*

*Dr. M. N. Giriy*

*(B. A. V. Chikati)*

*Ashish*

*MR*

*(R. R. Chide)*

| Sr. No .     | List of practical  | No of hours | No of sheet |
|--------------|--|-------------|-------------|
| 01           | Projection of Straight lines – Simple positions, Minimum 4 problems on Projection of Straight lines: Inclined to both the planes.  | 2           | 1           |
| 02           | Two problems each of Construction of conic section by using various methods. Ellipse, Parabola and Hyperbola, One problem each of Cycloid, Involute, Archimedean Spiral. | 2           | 1           |
| 03           | Minimum 4 problems on Projection of planes – Perpendicular and oblique planes  | 2           | 1           |
| 04           | Minimum 4 problems on Projection on auxiliary planes( Excluding True shape)  | 4           | 1           |
| 05           | Minimum 4 problems on Projection of Solids : Simple positions, Axis inclined to one plane & parallel to other  | 4           | 1           |
| 06           | Minimum 4 problems on Section of Solids(only one stage) – Prism & Pyramids, Cylinder & Cones, Development of Lateral Surfaces – Prism, Pyramid, Cylinder & Cones         | 4           | 1           |
| 07           | Minimum 4 problems on Isometric View and Minimum 4 problems Projection, Prism, Pyramid Cylinder and Cone, General Object   | 6           | 2           |
| <b>Total</b> |  | <b>24</b>   | <b>08</b>   |

**References:****Text Books Recommended:**

Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India

Dhawan, R. K., (2000), "A Textbook Of Engineering Drawing", S. Chand, New Delhi

**Reference Books Recommended:**

Jolhe, D. A., (2015), "Engineering Drawing ", Tata McGraw Hill, New Delhi

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P.S. Gill , (2015) "Engineering Drawing", S.K.Kataria and sons,

Dr. M. N. Giny  
 Dr. M. N. Giny  
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RTM Nagpur University  
Syllabus (Theory)

| Semester   | Course Title<br>(Subject)<br><i>Code:<br/>BSE1-6T</i> | Hours / Week |   |   | Cr<br>edi<br>ts | Maximum Marks                   |                                   |       | Exam<br>Durati<br>on<br>(Hrs.) |
|------------|---|--------------|---|---|-----------------|---------------------------------|-----------------------------------|-------|--------------------------------|
|            |   | L            | T | P |                 | Conti<br>nual<br>Assess<br>ment | Unive<br>rsity<br>Exami<br>nation | Total |                                |
| B.E. I Sem | Basics of Civil and Mechanical Engineering            | 4            | - | - | 0               | 50                              |                                   | 50    |                                |

**Sr. No.** **Course Objective**

The objective of this course is—

- 1 To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering
- 2 To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness
- 3 To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.
- 4 To introduce manufacturing processes applying proper method to produce components. To be able to select and compare domestic appliances.
- 5 To get knowledge about various energy sources and its conversion.
- 6 To get acquainted with vehicle systems.

**Course Outcomes**

After successful completion of this course the student will be able to:

|     |  |
|-----|--|
| CO1 | Introduction to what constitutes Civil Engineering. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering. Highlighting the depth of engagement possible within each of these areas.  |
| CO2 | Exploration of the various possibilities of a career in this field. Understanding the vast interfaces this field has with the society at large. Providing inspiration for doing creative and innovative work   |
| CO3 | Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration. Highlighting possibilities for taking up entrepreneurial activities in this field. Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering |
| CO4 | Discuss several manufacturing processes and identify the suitable process. Explain various types of mechanism and its application  |
| CO5 | Describe and compare the conversion of energy from renewable and non-renewable energy sources.   |
| CO6 | List down the types of road vehicles and their specifications; Illustrate various basic parts and transmission system of a road vehicle.   |

*Girija*

*Ashutosh  
(ARBhardt)*

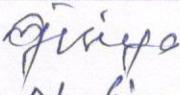
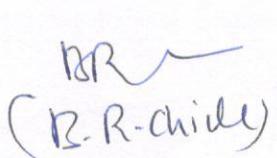
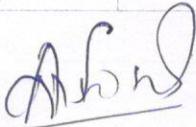
*DR*

*Ahmed  
(B.R.Chide) (Dr. Sajid Ansari)*

| SYLLABUS   |             |  |
|--|-------------|--|
| Contents   | No of hours |  |
| <b>Unit-I :</b><br><b>Basic Understanding:</b><br>Role of Civil Engineering in Infrastructure development. Current budgets for infrastructure works; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers.<br><b>Fundamentals of Architecture &amp; Town Planning:</b> Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities<br><b>Fundamentals of Building Materials:</b> Stones, bricks, mortars, Plain, Reinforced&Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel,Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes<br><b>Basics of Construction Management &amp; Contracts Management:</b> Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems; Importance of Contracts Management | 8           |  |
| <b>Unit-II:</b><br><b>Environmental Engineering &amp; Sustainability:</b> Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction.<br><b>Geotechnical Engineering:</b> Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics &tunneling.<br><b>Hydraulics, Hydrology &amp;Water Resources Engineering:</b> Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi- purpose reservoir projects.<br><b>Structural Engineering:</b> Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies.<br><b>Surveying &amp;Geomatics:</b> Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR.<br><b>Traffic &amp;Transportation Engineering:</b> Investments in transport infrastructure development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; Road Safety under heterogeneous traffic.   | 8           |  |
| <b>Unit-III:</b><br><b>Repairs &amp; Rehabilitation of Structures:</b> Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non-Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs.<br><b>Computational Methods, IT, IoT in Civil Engineering:</b> Typical software used in  | 8           |  |

*Prinay**Bhakti**M. R. Chidki**Ashok*

|  |    |
|--|----|
| Civil Engineering: Highway design (MX), Building Information Modelling; Highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, NASTRAN, NISA, MIKE21, MODFLOW, REVIT, TEKLA, AUTOCAD, ... GEOSTUDI O, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM.)<br>Basics of Professionalism: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction.   |    |
| <b>Unit IV :</b><br><b>Introduction to Manufacturing:</b> Conventional Manufacturing Processes: Casting, Forging, Metal forming (Drawing, Extrusion, etc.), Sheet metal working, Metal joining, etc and components produced. Metal cutting processes and machining operations Turning, Milling and Drilling, etc. Additive manufacturing and 3D Printing.. Basic CNC programming: Concept of Computer Numerical Controlled machines.   | 8  |
| <b>Engineering Mechanisms and their application in Domestic Appliances:</b> Introduction to Basic mechanisms and equipment: Pumps, blowers, compressors, springs, gears, Belt-Pulley, Chain-Sprocket, valves, levers with its applications in day to day life. Introduction to terms: Specifications, Input, output, efficiency, etc. Applications of: Compressors - Refrigerator, Water cooler, Split AC unit; Pumps - Water pump for overhead tanks, Water filter/Purifier units; Blower - Vacuum cleaner, Kitchen Chimney; Motor - Fans, Exhaust fans, Washing machines.  |    |
| <b>Unit V Introduction of energy sources &amp; its conversion</b><br><b>Energy sources:</b> Conventional and Renewable Energy sources, Thermal energy, Power plant, Hydropower energy, Nuclear energy, Solar energy, Geothermal energy, Wind energy, Hydrogen energy, Biomass energy and Tidal energy.<br><b>Energy conversion devices:</b> Introduction of pump, compressor, turbines, wind mills, photovoltaic cells, Two stroke and Four stroke engines (Petrol, Diesel and CNG engines). Steam generators.   | 8  |
| <b>Unit VI:</b><br><b>Vehicles and their Specifications:</b> Classification of automobile. Vehicle specifications of two/three wheeler, light motor vehicles, trucks, buses and multi-axle vehicles. Engine components (Introduction). Study of engine specifications, comparison of specifications of vehicles. Cost analysis of the Vehicle.<br><b>Vehicle systems:</b> Introduction of chassis layouts, steering system, suspension system, braking system, cooling system and fuel injection system and fuel supply system. Study of power transmission system, clutch, gear box, propeller shaft, universal joint, differential gearbox and axles. Vehicle active and passive safety arrangements: seat, seat belts, airbags and antilock brake system. Study of Electric and Hybrid Vehicle systems. | 8  |
| Total no of hours  | 48 |

Dr. M. N. Giriya  
  
  
  


## (ORGANISATION OF COURSE) Only for Basic Civil Engineering

|                   | Module [No. of Lectures Within brackets]  | Tutorials/Activity  |
|-------------------|---|---|
| 1                 | Basic Understanding (1)   | Develop a matrix of various disciplines and possible roles for engineers in each  |
| 2                 | History of Civil engineering (1)  | Identify 10 ancient monuments and ten modern marvels and list the uniqueness of each  |
| 3                 | Overview of National planning for Construction and Infrastructure Development (1) | Develop a Strategic Plan for Civil Engineering works for next ten years based on past investments and identify one typical ongoing mega project in each area  |
| 4                 | Architecture & Town Planning (1)  | Identify ten best civil engineering projects with high aesthetic appeal with one possible factor for each; List down the possible systems required for a typical Smart City   |
| 5                 | Building Materials (1)  | Identify three top new materials and their potential in Construction  |
| 6                 | Construction Management, Contracts management (1)                                 | Identify 5 typical construction methods and list their advantages/ positive features  |
| 7                 | Environmental Engineering (1)   | Write a report on Water Treatment plant and Waste water treatment plant.  |
| 8                 | Geotechnical Engineering (1)  | List top five tunnel projects in India and their features; collect and study geotechnical investigation report of any one.  |
| 9                 | Hydraulics, Hydrology & Water Resources Engineering (1)                           | Identify three river interlinking projects and their Features.  |
| 10                | Ocean Engineering, Ports & Harbours (1)   | Identify 5 typical ports in India and list the structures available in them; Case study report of any one.  |
| 11                | Power Plant Structures (1)  | Collect the typical layout for a large thermal power plant.   |
| 12                | Structural Engineering (3)  | Identify 5 unique features for typical buildings, bridges, tall structures and large span structures; and make a report.  |
| 13                | Surveying & Geomatics (1)   | Identify five location by using Google Earth Map and study.   |
| 14                | Traffic & transportation (1)  | Enlist the NH, SH and their linking and make a report   |
| 15                | Repairs & rehabilitation of Structures (1)  | Identify the major rehabilitation project and make case study report  |
| 16                | Computational Methods, IT, IoT in Civil Engineering (2)                           | Visit an AutoCad lab and prepare a report; Identify ten interesting software systems used in Civil Engg and their key   |
| 17                | Basics of Professionalism (3)   | List 5 cases of violation of professional ethics and list preventive measures; Identify 5 interesting projects and their positive features; Write 400 word reports on one ancient monument and a modern marvel of civil engineering |
| Total 22 lectures |   | In 11 Tutorials or any 17 Activity expected   |

**References:****Text Books Recommended:**

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. MeenaRao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
3. Chaudhari and Hajra, "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers, Mumbai
4. Rai ,G.D.,(1999), Nonconventional Energy Sources" Khanna Publisher.
5. Rajput, R.K., (2007), "Basic Mechanical Engineering", Laxmi Publications Pvt. Ltd.
6. Ganeshan, V., (2018), "Internal Combustion Engines", McGraw Hill
7. Agrawal,Basant and Agrawal, C. M., (2008), "Basics of Mechanical Engineering", John

Wiley and Sons, USA

**Reference Books Recommended:**

1. Pravin Kumar, (2018), " Basic Mechanical Engineering, 2nd Ed.", Pearson (India) Ltd
2. Groover,Mikell P., (1996), "Fundamentals of Modern Manufacturing: Materials, Processes, and Systems", Prentice Hall, USA
3. Khurmi, R.S. ,and Gupta, J. K., "A Textbook of Thermal Engineering", S. Chand & Sons
4. The National Building Code, BIS,(2017)
5. RERA Act,(2017)
6. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn.Avinash PublicationsMumbai
7. Avtarsingh (2002), Law of Contract, Eastern Book Co.
8. Dutt (1994), Indian Contract Act, Eastern LawHouse
9. Anson W.R.(1979), Law of Contract, Oxford UniversityPress
10. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case lawon UNCITRAL Model Law on Arbitration, Indian Council ofArbitration
11. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern BookCo.
12. Wadhra (2004), Intellectual Property Rights, Universal Law PublishingCo.
13. P. S. Narayan (2000), Intellectual Property Rights, Gogia LawAgency
14. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia LawHouse
15. Bare text (2005), Right to Information Act
16. O.P. Malhotra, Law of Industrial Disputes, N.M. TripathiPublishers
17. K.M. Desai(1946), The Industrial Employment (Standing Orders)Act
18. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia PublishingHouse
19. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2,pp 117-127, MCB UPLtd
20. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study andApplication
21. Ethics in Engineering- M.W.Martin&R.Schinzingher,McGraw-Hill
22. Engineering Ethics, National Institute for Engineering Ethics,USA
23. [www.ieindia.org](http://www.ieindia.org)
24. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard,M.J.Rabins
25. Resisting Bureaucratic Corruption: Alacrity Housing Chennai (Teaching CaseStudy)
26. -S. Ramakrishna Velamuri -CEIBS
27. CONSTRUCTION CONTRACTS,<http://www.jnormanstark.com/contract.htm>
28. Internet and Business Handbook, Chap 4, CONTRACTSLAW, <http://www.laderapress.com/laderapress/contractslaw1.html>
29. Contract&Agreements , <http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm>
30. Contracts,<http://206.127.69.152/jgretch/crj/211/ch7.ppt>
31. Business & Personal Law. Chapter 7. "How ContractsArise", <http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt>
32. Types of Contracts,<http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt>
33. IV. TYPES OF CONTRACTS AND IMPORTANTPROVISIONS, <http://www.worldbank.org/html/opr/consult/guidetxt/types.html>
34. Contract Types/Pricing Arrangements Guideline- 1.4.G(11/04/02), <http://www.sandia.gov/policy/14g.pdf>

Given  
By Mr. N. Griggs  
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BR  
(B. R. Chidley)

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**Faculty of Science and Technology**  
**R.T.M Nagpur University, Nagpur**  
**Syllabus for B. Tech. Second Semester**

**Mathematics – II**

**Total Credits: 4**

**Teaching Scheme**

Lectures: 3 Hours/Week

Tutorial: 1 Hour/Week

**Subject Code: BES2-1**

**Examination Scheme**

Theory T (U): 70 Marks, T (I): 30 Marks

Duration of University Exam: 3 hours

**Course Objectives:**

1. The objective of the course is to inculcate and strengthen analytic ability among the engineering students and to create zeal of working with higher mathematics and its applications in the extensive field of engineering.
2. The topics covered will serve as basic tools for specialized studies in many fields of engineering and technology.

**Course Outcomes:**

After completing the course, students will be able to

1. Analyze real world scenarios to recognize when integrals are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
2. Define and understand the geometry of vector differential operators and line and surface integrals.
3. Explain and apply principles of study design and data collection.
4. Develop an ability to identify, formulate and/or solve real world problems.
5. Understand the impact of scientific and engineering solutions in a global and societal context.

**Unit 1: Integral Calculus** **(13 Hours)**

**Evaluation of Definite and Improper Integrals:** Beta and Gamma functions and their properties, Differentiation of definite integral, Mean value, Mean square value and Root mean square value.

**Curve Tracing:** Tracing of curves (Cartesian), Applications of definite integrals to find length of curve, area, volume and surface area of solids of revolution (Cartesian, Polar and Parametric curves).

**Unit 2: Multivariable Calculus (Integration)** **(13 Hours)**

**Multiple Integration:** Double integrals (Cartesian and Polar), Change of order of integration in double integrals, Change of variables (Cartesian to Polar).

**Applications:** Area, Mass, Volume and Center of Gravity (constant and variable densities), Elementary triple integrals.

**Unit 3: Vector Calculus** **(10 Hours)**

**Vector Calculus:** Vector triple product, Product of four vectors, Scalar point function, Vector point function, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives, Solenoidal and Irrotational motions

**Vector Integration:** Line integrals and Work done.

**Unit 4: Statistics** **(6 Hours)**

**Fitting of a Curve by Method of Least Squares:** Straight line  $y = a+bx$ , Second degree parabola  $y = a+bx+cx^2$  and curves of the type  $y = ae^{bx}$ ,  $y = ab^x$  and  $y = ax^b$ , Coefficient of correlation and Lines of regression, Rank correlation.

**Unit 5: Finite Differences** **(6 Hours)**

Operators E & Delta, Factorial polynomial, Lagrange's interpolation formula for unequal intervals of arguments.

**Numerical Integration:** Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule, Difference equations with constant coefficients.

**Text/Reference Books:**

- (1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- (2) Ramana B.V., Higher Engineering Mathematics, Tata Mc-Graw Hill, New Delhi, 11th Reprint, 2010.
- (3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- (4) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
- (5) P. N. Wartikar and J. N. Wartikar, Applied Mathematics, Volume I and II.
- (6) H.K Dass, Rama Verma, Rajnish Verma, V.J. Dagwal, Sajid Anwar and D.F. Shastrakar, Engineering Mathematics, Volume I and II, S. Chand.

## **B.Tech. Semester II Advanced Engineering Materials (Total Credits 3)**

| <b>Teaching Scheme</b>                 | <b>Examination Scheme</b>                   |
|--|---|
| <b>Lectures: 2 Hours/Week Theory,</b>  | <b>T(U): 70 Marks T(I): 30 Marks</b>        |
| <b>Tutorial/Activity: 2 Hours/week</b> | <b>Duration of University Exam: 3 Hours</b> |

### **Unit - 1: Band theory of solids (6 Hrs) 14 Marks**

Basic idea of free electron theory of metals, expression of conductivity of a metal. Formation of energy bands in Solids, Fermi energy and Fermi level.

Classification of solids on the basis of energy band diagram: Conductors, Semiconductors and Insulators, concept of Fermi energy.

### **Unit-2: Semiconductor Devices (7 Hrs) 14 Marks**

Types of Semiconductor diodes, P-N junction Diode: Characteristics of P-N junction Diode, Tunnel Diode, Zener Diode, LED, Photodiode.

Transistors . Hall effect, Hall voltage and Hall coefficient; its applications,

### **Unit 3: Magnetic and Superconducting Materials (10 Hrs) 14 Marks**

Diamagnetic, Paramagnetic, Ferromagnetic, Ferri-magnetic and anti ferromagnetic materials: Explanation on the basis of domain. Hysteresis curve, Characteristics of ferromagnetic, diamagnetic and paramagnetic materials and their applications.

Superconductors: Basics of superconductivity: Zero electrical resistance, Persistent current Effect of Temperature, Effect of Magnetic Field, Critical Current; The Meissner Effect.Type-I and type-II superconductors, London Equation: The penetration depth, Bardeen-Cooper-Schrieffer (BCS) theory.

### **Unit 4: Lasers (7 Hrs) 14 Marks**

Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Meta stable states, Principle of laser, Laser characteristics, Coherence length and coherence time, Pumping schemes: Three level and Four level.

Optical Resonator, Construction & working of Ruby laser and He-Ne laser, Applications of laser.

### **Unit 5: Nanoscience and Nanomaterials (6 Hrs) 14 Marks**

Introduction to Nanoscience, Classification of nano materials, Types of Synthesis of Nanomaterials, Comparison of properties of nanomaterials with bulk materials,

Some special nanomaterials: 1) Zeolites, 2) Graphine, Application of nanomaterials in engineering.

## **Course Outcomes**

### **Students will be able to**

**CO1.** Learn the concept of formation of energy bands and to classify solids on its basis.

**CO2.** Identify and explain different types of diodes, transistors and its applications

**CO3.** Learn the concepts of magnetism and superconductivity, classify and analyze various types of magnetic and superconducting materials.

**CO4.** Learn and explain quantum transitions and apply it to working of lasers.

**CO5.** Learn the concept of nano materials and compare its properties with those of bulk materials.

### **Suggested Text Books &Reference Books**

1. *Solid state Physics, S. O. Pillai, New Age publications.*
2. *Charles Kittel, Introduction to Solid State Physics, Wiley Eastern, 5th edition,(1983).*
3. *A.J. Dekker Electrical Engineering Materials, Prentice Hall of India(1971).*
4. *Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker, John Wiley and Sons Inc.*
5. *K. Thyagarajan and A. K. Ghatak, Lasers Theory and Applications, Mcmillan(1981).*
6. *A textbook of Engineering Physics, Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar, S. Chand Publication*
7. *A text Book of Advanced Engineering Materials, Dr. D. S. Hardas, , Dr.S.Shastri, Dr. (Mrs)S.P. Wankhede, Dr. D. S. Bhoumik, Dr.(Mrs.)S.U.Bhonsule, Dr.Shruti Patle, , Das Ganu Publication ISBN-978-93-84336-70-7 (2021)*
8. *A text Book of Advanced Physics, Dr. D. S. Hardas, Dr.A. R. Panat , Das Ganu Publication ISBN-978-93-81660-49-2 (2013)*
9. *Advanced physical science for Engineers, Dr. S. Patle, Dr. S. U. Bhonsule, Dr. N. Ugemuge, Dr. S. P. Wankhede, DNA publication*
10. *Advanced Engineering Materials, M. N. Avdhanulu, Shilpa A. Pande, Arti R. Golhar, Mohan Giriya, S. CHAND*
11. *W. Saslow, Electricity, Magnetism and light.*
12. *Solid state Physics by R. L. Singhal, Kedarnath Ramnath & Co.Meerut*
13. *Introduction to Lasers Theory and Applications by M. N. Avadhanulu, S. Chand and Company*
14. *Engineering Physics by P. K. Palaniswamy, Scitech(2005)*
15. *Engineering Physics by H. Malik and A. K. Singh,TMH(2010)*
16. *Engineering Physics by D. K. Bhattacharya and A. Bhaskaran, Oxford University Press (2010)*
17. *Materials Science and Engineering- A First course by V. Raghavan, PHI Learning*

## **List of Activities**

1. Study of band gap of various semiconducting materials.
2. Variation of Fermi energy with respect to various parameters.
3. Identification of N-type & P-type semiconductor on virtual lab.
4. Testing of resistor, transistor, diode, capacitor with the help of multimeter / CRO.
5. Compare Cut-in-voltages of various LEDs.
6. Study of lines of force using bar magnet & iron fillings.
7. Gather information about Maglev train.
8. Write up on History of superconductivity.
9. Study of application of superconductor.
- 10 Measure the divergence of various sources of light such as torch, laser, tubelight, etc.
11. Understanding the phenomenon of stimulated emission, absorption & stimulated emission.
12. Laser applications in day to day life.
13. Collect information about Holography.
14. Write short note on Discovery of nano materials
15. Applications of nano materials.
16. Industrial Visit

**Note : Performance of at least one activities is compulsory in a semester.**

## **B. E. Semester II Advanced Engineering Materials (Practical)**

**(Total Credits: 1)**

| <b>Teaching scheme</b>      | <b>Examination Scheme</b>             |
|-----------------------------|---------------------------------------|
| <b>Lectures: 2 hrs/Week</b> | <b>P(I): 25 Marks P(U) : 25 Marks</b> |

### **List of Experiments**

1. Energy gap of semiconductor /thermistor
2. Parameter extraction from V-I characteristics of PN junction diode.
3. Parameter extraction from V-I characteristics of Zener diode.
4. Parameter extraction from V-I characteristics of PNP/NPN transistor in CB and CE mode.
5. V-I Characteristics of Tunnel diode.
6. V-I Characteristics of Light Emitting Diodes.
7. Study of Diode rectification.
8. Study of Hall Effect and determination of Hall Voltage of given sample.
9. Variation of Hall coefficient ( $R_H$ ) with temperature.
10. To study B-H curve and to find out the values of coercivity, retentivity and saturation magnetisation of experimental material.
11. Laser source: Determination of wavelength by diffraction grating.

**Note:** Performance of at least **six** experiments is compulsory in a semester.

### Scope of the syllabus

### Second Semester: Advanced Engineering Materials

#### **Unit - 1: Band theory of solids**

Free electron theory in metals; Derivation for expression of conductivity of a metal, drift velocity, Band theory of solids, Energy Bands, Energy Gap, classification of solids, Fermi function and its variation with temperature; Detailed discussion of relative positions of conduction band and valence band in conductor, insulator and semiconductor.

Concept of effective mass, Semiconductors: Intrinsic and Extrinsic Semiconductors, conduction process in Semiconductors, Energy band diagrams of Intrinsic and Extrinsic Semiconductors at T=0K and T>0K, expression for fermi energy in Intrinsic Semiconductors without derivation,

#### **Unit-2: Semiconductor Devices**

P-N junction Diode, Unbiased, forward biased & reversed biased mode, Transistor action, Hall effect, Hall Coefficient , Characteristics of Tunnel Diode, Zener Diode, LED,Photodiode

#### **Unit 3: Magnetic and Superconducting Materials**

Introduction to magnetic materials, magnetic field, magnetic dipole moment, magnetic induction, magnetization, magnetic susceptibility, magnetic permeability, classification of magnetic materials (diamagnetic, paramagnetic, ferromagnetic), domain hypothesis, B-H curve , antiferromagnetic, ferrimagnetism, Applications: Alnico and magnetic storage

Introduction to superconductivity: Zero electrical resistance, Persistent current Effect of Temperature, Effect of Magnetic Field, Critical Current; The Meissner Effect, Type-I and type-II superconductors, London Equation: The penetration depth, Bardeen-Cooper-Schrieffer (BCS) theory.

#### **Unit 4: Lasers**

Meaning of coherence length of laser, expression for coherence length and coherence time, Laser Emission, Lasing action, optical resonant cavity: Construction and its role in LASERS, three and four level pumping scheme, Laser characteristics: Directionality, Divergence, Intensity, Coherence, Monochromaticity.

#### **Unit 5: Nanoscience and Nanomaterials**

Introduction to nanoscience, Classification of nano materials, Types of Synthesis of Nanomaterials, Reasons for drastic changes in properties at nanoscale, Comparison of properties of nanomaterials with bulk materials, Some special nanomaterials: 1) Zeolites, 2) Graphine, Applications of nanomaterials in engineering.

**RTMNU, Nagpur**  
**SYLLABUS FOR FIRST YEAR (SEMESTER II) BACHELOR OF TECHNOLOGY**  
**(For All Branches)**

|                             |                          |            |                |
|-----------------------------|--------------------------|------------|----------------|
| <b>Course Code</b>          | <b>BSE2---3T</b>         |            |                |
| <b>Course Title</b>         | <b>APPLIED CHEMISTRY</b> |            |                |
| <b>Scheme &amp; Credits</b> | <b>L</b>                 | <b>T/A</b> | <b>Credits</b> |
|                             | <b>3</b>                 | <b>2</b>   | <b>4</b>       |

|                                      |  |
|--------------------------------------|--|
| <b>Examination Scheme</b>            |  |
| <b>T(U): 70 Marks T (1) 30 Marks</b> | <b>Duration of University Exam. : 03 Hours</b> |

**Course Objectives.**

- 1) To acquaint the students with the basic concepts of Chemistry, and their applications in the Engineering field.
- 2) To gain the knowledge on properties of materials, and protection of materials from corrosion.
- 3) To impart basic knowledge related to ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- 4) To provide an insight into Green Chemistry and its applications in engineering fields.
- 5) To enable the student to upgrade the existing knowledge of water technologies and to enhance the thinking capabilities in line with the modern trends in Engineering and technology.

**Course Outcomes**

The course will enable the students to

- CO1. Rationalize the periodic properties and analyze the Microscopic Chemistry in terms of atomic and molecular orbital.
- CO2. Rationalize bulk properties and processes using thermodynamic processes & understand the causes of corrosion, its consequences and methods to minimize corrosion.
- CO3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- CO4. Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.
- CO5. Know about treatment of water and its applications in industry.

**UNIT-1: Periodic Properties and Atomic, Molecular Structure**

**( 8 Hours ) (Marks 14)**

- Periodic properties :- Effective Nuclear charge, electronegativity and polarizability
- Numerical on Slater's Rule
- Atomic, molecular structure:- Atomic and Molecular orbitals. Molecular Orbital Theory and Energy level diagrams of homo diatomic molecules (Hydrogen to Fluorine) and hetero diatomic molecules, NO, NO<sup>+</sup>, NO<sup>-</sup> and HF.
- Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties (tetrahedral and Octahedral complexes).

**UNIT-2 Thermodynamic & Corrosion**

**(8 Hours) (Marks 14)**

- Definition & basic equation of internal energy and enthalpy
- Numerical on internal energy, enthalpy change (Hess's Law)
- Second law of Thermodynamics, reversible and irreversible reactions
- Role or use of Gibbs free energy in a) chemical equilibrium, b) oxidation reduction
- Corrosion- Definition, Causes, theories of corrosion- dry, wet and differential aeration

- Numerical on Pilling Bedworth Rule
- Types of corrosion- pitting, inter granular, and stress corrosion
- Prevention and control of corrosion- design and material selection, cathodic protection.

### **UNIT-3 Applications of Spectroscopic Techniques**

**(8 Hours) (Marks 14)**

- Principles of spectroscopy and selection rules (Electronic Spectra of Transition Metal Complexes)
- Electronic spectroscopy- basic principles, Lambert-Beer's law, Woodward Fisher Rule for conjugated dienes.
- Numerical on Lambert-Beer's Law
- Numerical on Woodward Fischer Rule
- Fluorescence, Phosphorescence, Jablonski Diagram and its applications.
- Nuclear magnetic resonance - basic principle, chemical shift, spectral interpretation of some simple compounds and magnetic resonance imaging.

### **UNIT-4 Basic Green Chemistry**

**(7 Hours) (Marks 14)**

- Green Chemistry:- Introduction, twelve principles of Green chemistry with examples,
- Numerical based on atom economy
- Carbon sequestration & Carbon Credits,
- Green reagents, Dimethyl carbonate and its applications,
- Supercritical CO<sub>2</sub> properties and applications, uses and applications of biopolymers – polyadipic acid and polycaprolactum.

### **UNIT-5 Water Technology**

**(9 Hours) (Marks 14)**

- Importance of Hardness and Alkalinity of water.
- Industrial Water Treatment: Softening of water-principle, reactions, advantages, limitations and comparison of Zeolite process and De mineralization process.
- Numerical based on Zeolite process.
- Boiler Troubles - (causes, effect on boiler operation and methods of prevention) -Scales and sludges, Caustic embrittlement.
- Desalination of sea water- Principle methods and advantages of electro dialysis and reverse osmosis processes
- Waste Water Treatment (introduction and importance) - Water treatment from biological waste water to clean water production, Membrane bio reactors.

#### **Books Recommended:**

1. Applied Chemistry: Dr. Avinash V. Bharati, Dr. (Mrs.) Seema A. Shrivastava, Dr. (Mrs.) Seema G. Rawat, Dr. Indrani B. Das Sarma, Dr. (Mrs.) Jyoti N. Thakre, Dr. Kiran M. Khandalkar. Published by Das GanuPrakashan, Nagpur (India)
2. Text Book of Engineering Chemistry: S.S. Dara, S. S. Umare, Published by S. Chand and Company Ltd. New Delhi
3. Textbook of Engineering Chemistry P.C. Jain and Monica Jain, Published by DhanpatRai and Sons, New Delhi.

#### **Reference Books:**

1. A textbook of Engineering Chemistry by RajashreeKhare, Published by S. K. Katariya and sons
2. University Chemistry, by B. H. Mahan.
3. Organic Chemistry by Paula Y. Bruice, Published by Pearson
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Fundamentals of Molecular Spectroscopy, by C. N. BanwellIndia.

6. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M.S. Krishnan
7. Physical Chemistry, by P. W. Atkins
8. A Text book of Engineering Chemistry: Shashi Chawla; DhanpatRai& Sons, New Delhi.
9. Engineering Chemistry: A.V. Bharati and Walekar, Tech Max Publications, Pune.
10. Selected Topics in Inorganic Chemistry: Madan, Malik, Tuli.
11. Elementary Organic Spectroscopy by Y. R. Sharma, Published by S. Chand and Company Ltd. New Delhi

|                             |                                     |          |          |                |                 |
|-----------------------------|-------------------------------------|----------|----------|----------------|-----------------|
| <b>Course Code</b>          | <b>BSE2-3P</b>                      |          |          |                |                 |
| <b>Course Title</b>         | <b>APPLIED CHEMISTRY LABORATORY</b> |          |          |                |                 |
| <b>Scheme &amp; Credits</b> | <b>L</b>                            | <b>T</b> | <b>P</b> | <b>Credits</b> | <b>Semester</b> |
|                             | <b>0</b>                            | <b>0</b> | <b>3</b> | <b>1.5</b>     | <b>II</b>       |

|  |  |
|--|--|
| <b>Examination Scheme</b>              |  |
| <b>P (U): 25 Marks P (I): 25 Marks</b> | <b>Duration of University Exam. : 03 Hours</b> |

### **Course Outcomes**

After completion of course students will learn to:

- 1) Measure molecular/system properties like, concentrations, surface tension, conductance of solutions etc.
- 2) Estimate the soluble impurities present in the given water sample.
- 3) Handle the different instruments used in chemistry laboratory.

### **Students should**

- Perform any eight experiments.
- Study of any one experiment in virtual lab topics based on the syllabus.
- Study of any one demonstration experiment.

- 1) Preparation of different solutions molar solution, Normal solution.
- 2) Determination of surface tension of a given liquid solution, percent
- 3) Determination Hardness of water sample by complexometric method.
- 4) Determination of types and extent of alkalinity of water sample
- 5) Determination of free chlorine in water sample by lodometry
- 6) Determination of cell constant and conductance of a given solution.
- 7) Synthesis of a polymer/drug
- 8) Estimation of Fe/Fe by redox titrimetry
- 9) Determination of capacity of cation exchange resin.
- 10) Determination of Dissolve Oxygen.
- 11) Demonstration of study of Adsorption of Acetic acid by Charcoal.
- 12) Demonstration of Thin layer Chromatography
- 13) Demonstration of Potentiometric titration of an unknown weak Monoprotic Acid
- 14) Virtual Demonstration of UV-Visible spectrophotometer and FTIR (Fourier transformation infrared spectroscopy)
- 15) Virtual Demonstration of Lambert-Beer's Law

### **ACTIVITY**

Students should perform any one activity

- 1) Drinking water quality analysisHardness,Alkalinity, pH, TDS
- 2) Titration of Aspirin tablets
- 3) Study of commonly used antacid tablets
- 4) Interpretation of NMR spectra of 10 compounds
- 5) Corrosion of surrounding materials
- 6) Application of chromatography in industry

**Computational Skills**  
**(Total Credits: 02)**  
**SUBJECT CODE: BSE2 - 4T**

**Teaching Scheme**  
**Practical: 2 Hours/Week**

**Examination Scheme**  
**Theory**  
**T (U): 35 Marks T (I): 15 Marks**  
**Duration of University Exam: 02 Hrs**

**Unit 1:** Introduction to Programming (6 Hrs)  
 Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)  
 Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.  
 From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.  
 Arithmetic expressions and precedence

**Unit 2:** (10 Hrs)  
 a) Conditional Branching and Loops : Writing and evaluation of conditionals and consequent branching Iteration and loops  
 b) Arrays : Arrays (1-D, 2-D), Character arrays and Strings  
 c) Basic Algorithms : Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

**Unit 3:** (8 Hrs)  
 a) Function : Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference  
 b) Recursion : Recursion, as a different way of solving problems. Example programs, such as Finding Factorial

**Unit 4:** (6 Hrs)  
 a) Structure : Structures, Defining structures and Array of Structures  
 b) Pointers : Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

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*(Signature)*  
 (Sajid Anwar) *(Signature)*  
 (Arvind Bhardwaj)

*(Signature)*  
 (B.R.Chide)

*(Signature)*  
 Dr. M.N. Girija

**Computational Skills (Total Credits: 01)****SUBJECT CODE: BSE2 – 4P****Teaching Scheme****Practical:** 2 Hours/Week**Examination Scheme****Practical****P (U): 25 Marks P (I): 25 Marks****Duration of Internal Practical Exam: 02 Hrs****Students have to perform Practicals based on the theory :****Practical Slot – 1: Fundamentals of Computers and Operating System**

- 1) Demonstrate the internal structure of Computer, its assembly, use of each I/O device and ports.
- 2) Demonstrate the use of System Software like: Windows, Linux .
- 3) Explanation about “C” language Complier options. Introduction to C++ language.

**Practical Slot – 2: Fundamentals of “C” language**

- 1) To demonstrate all types of operators (Arithmetic, Logical and Relational) of “C” language.
- 2) To demonstrate different data types in “C” language.
- 3) To demonstrate the use of “printf” and “scanf” with all possible options.

**Practical Slot – 3: Fundamentals of Decision Control Structures**

- 1) To demonstrate the use of if-else structure, nested if structure.
- 2) To demonstrate the use of Conditional operators (? Operator).
- 3) To demonstrate the use of Switch.Case construct.

**Practical Slot – 4: Fundamentals of Loop Control Structures**

- 1) To demonstrate the use of “while” control structure.
- 2) To demonstrate the use of “do..while” control structure.
- 3) To demonstrate the use of “for” control structure.
- 4) To demonstrate the use of “break” and “continue” construct

**Practical Slot – 5 and 6: Fundamentals of One Dimensional Arrays**

- 1) To demonstrate the creation of array, addition of an element, deletion of an element and displaying the elements from one dimensional array.
- 2) To demonstrate the implementation of bubble sort, selection sort and insertion sort.
- 3) To demonstrate the implementation of linear search and binary search.

**Practical Slot – 7: Fundamentals of Two Dimensional Arrays**

- 1) To demonstrate the matrix manipulation operations like addition, multiplication.
- 2) To demonstrate the operations on row and columns of two dimensional matrix.

**Practical Slot – 8: Fundamentals of Pointers**

- 1) To demonstrate the pointer declaration and its use.
- 2) To demonstrate the implementation of pointer on array.
- 3) To demonstrate the creation of dynamic arrays using pointer.

**Practical Slot – 9: Fundamentals of Strings**

- 1) To demonstrate the basic operations on string like “length”, “copy”, “reverse”, “truncate”.
- 2) To demonstrate the implementation of two dimensional array of characters.

**Practical Slot – 10: Fundamentals of Functions**

- 1) To demonstrate the implementation of functions.
- 2) To demonstrate the call by value parameter passing method.
- 3) To demonstrate the call by reference parameter passing method.

**Practical Slot – 11: Fundamentals of Functions**

- 1) To demonstrate the implementation of recursive function.
- 2) To demonstrate the use of library function (mathematical and string).

DR  
 (B.R.Chide)

Girija  
 Dr. M. N. Girija

**Method to conduct the practicals: Out of the two hours allotted:**

The faculty member will teach the basic concepts of practical to the students for 30 minutes.

The next 30 minutes will be on how to implement the problem definition of the practical, i.e., algorithm to implement the problem definition.

The next 1 hour, the students will implement the practical and execute it on computers.

For example: Fundamentals of Loop Control Structures

**Contents:**

To demonstrate the use of "while" control structure.

To demonstrate the use of "do..while" control structure. To demonstrate the use of "for" control structure.

To demonstrate the use of "break" and "continue" construct.

**Cover the concepts of:**

While loop, do..while loop, for loop and break & continue statement.

Explain the implementation of control structure on practical and LCD projector to students. Give one problem definition containing all the concepts of practical and allow students to implement and execute on the computers.

**Books Recommended:**

1. Herbert Schildt - C Complete Reference (Tata-McGraw Hill)
2. Byron Gottfried, " Programming with C ", Schaum's Outline Series .
3. R Venugopal & S R Prasad. "Mastering C" Tata-McGraw Hill-2207

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Abdul  
Arghadhi

DR  
(B.R. Chide)

Gondwani  
Dr. M.N. Gondwani

Basic Electrical Engineering (*BSE 2-6T*)  
(Total Credits: 02)

**Teaching Scheme****Lectures:** 2 Hours/ Week**Examination Scheme****Theory**

T (U) : 35 Marks T (I) : 15 Marks

Duration of University Exam. : 02 Hours

**Unit – I: Electric Circuits**

(8 Hrs)

EMF, Potential difference, current, power, Energy (Definition & Units SI), Ohms Law, types of sources (Current & Voltage), Ideal and Practical Sources (Independent Sources only), Source Conversion, Superposition theorem with DC source.

Circuit element resistance, factors affecting resistance, series & parallel combination of resistances, Kirchhoff's Laws (KVL, KCL) statement & Numerical, star Delta transformation, Circuit Element Inductance, Self and Mutual Inductance, Circuit Element Capacitance.

**Unit – II: Magnetic Circuits**

(6 Hrs)

Types of Magnetic Materials, flux, flux density, flux intensity, MMF, reluctance, permanence, permeability, analogous electric circuit, calculation for composite magnetic circuit, concept of leakage flux and fringing, B-H curve, phenomena of magnetic hysteresis.

**Unit - III: AC Circuits**

(8 Hrs)

Generation of single phase voltage, average and RMS value for sinusoidal waveform, periodic function, phasor representation of sinusoidal electrical quantities, steady state behavior of RLC circuit with excitation, reactance, impedance, power and energy in AC circuit, simple numerical on series and parallel AC circuit, concept and importance of power factor, resonance in series circuits. Principal of Generation of three phase voltage, Phase sequence, Star & Delta Connected three phase system, Voltage, Current & Power relations for Balanced three phase system only (With numerical).

**Unit – IV : Single Phase Transformer**

(8 Hrs)

Basic construction of Transformer (core & shell type), Principle of operation, EMF equation, Transformer ratings, No load & On load operation with leakage reactance, losses, efficiency, Definition & formula for voltage regulation, OC & SC test, equivalent circuit of the Transformer.

**Books Recommended:**

- 1) *Basic Electrical Engineering*: D.C. Kulshreshtha, Tata Mc-Graw Hill Pvt. Ltd.
- 2) *A Text Book of Electrical Technology*: B. L. Thareja and A. K. Thareja, S. Chand Publication.
- 3) *Generation of Electrical Energy*: B. R. Gupta 4<sup>th</sup> Edition, S Chand Publication
- 4) *Art & Science of Utilization of Electrical Energy*: H. Pratab, III Edition, Dhanpat Rai and Sons.
- 5) *Electric Circuits & Network*: K. Suresh Kumar, Pearson Publication.

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*Aliborhan*  
(Dr. Sajid Anwar)

*Asif*  
(Arborhan)

*BR*  
(B. R. Chide)

*mt*  
(m.a. wath)

*george*  
Dr m. n. Goyal

## Engineering Mechanics (BES2-7T)

Total Credits 2

**Teaching Scheme**  
Lecture : 2

**Examination Scheme**  
TU: 35 marks TI: 15 Marks

**Duration of Exam : 2 Hours**

**The Course Objective Is To Impart Knowledge Of**

1. To understand the effect of force and moment on the body.
2. To understand the concept of equilibrium and apply the conditions of equilibrium
3. To understand the concept of moment of inertia and apply on rectangular, square, circle or composite section of rectangular, square, circle.
4. To understand the principle of virtual work and apply on connected bodies.
5. To understand the work, energy, D Alemberts Principle and apply on connected bodies.
6. To understand the Impact, Impulse and apply on connected bodies

**After the completion of course student will be able to**

1. Students will be able to find effect of force on a body.
2. Students will be able to analyze the effect of a system of forces on a given body with the concepts of Equilibrium & Free body diagram.
3. Students will be able to calculate centroid/C.G. and moments of inertia.
4. Students will be able to solve problem of connected bodies by virtual work principal.
5. Students will be able to solve problem of connected bodies by work, energy, D Alemberts Principle.
6. Students will be able to solve problem of connected bodies by Impact, Impulse.

### **Unit - I : Important Vector Quantities: ( 10 Hrs )**

Position-vector, moment of a force about a point about an axis, couples, couple moment as a free vector. Equivalent force systems: Resultant of a 2 dimensional distributed loads and three-dimensional general force system Wrench.

### **UNIT - II : Equations of Equilibrium: ( 10 Hrs )**

Free body diagrams, Equations of equilibrium coplanar concurrent and Non-concurrent systems, General spatial force system.

**Truss:** Analysis of simple pin jointed frames by method of joints method of sections.

**Friction forces:** Law of Coulomb friction, problems involving dry friction, simple applications like wedges and band brakes.

### **Unit - III : (10 Hrs)**

(Dr. Sojat Aronil)

(Arshad Arshadali) girija mr  
Dr. m. n. Girija ( B.R.Chidé )

**Centroids and Moments of Inertia:** Second Moment and products of inertia of plane areas, Moment of inertia of masses. Transfer theorems for moment of inertia and Product of inertia, Polar moment of inertia, Principal axes, Mohr's circle of inertia.

**Virtual Work:** Introduction of Virtual work theorem: Principle of Virtual work applied to equilibrium of Mechanisms, simple beam, Pin jointed frames.

#### Unit -IV: (10 Hrs)

D'Alembert's Principle, work Energy method, (Expressions based on center of mass).

**Methods of Momentum :** Linear impulse momentum, considerations for a system of particles, Consideration of linear momentums, Elastic impact of two bodies, Direct central impact.

#### Books Recommended:

1. Engineering Mechanics: F.L Singer
2. Engineering Mechanics: Tmoshenko & Young
3. Engineering Mechanics: Bear and Johnson
4. Engineering Mechanics: I.H.Shames
5. Engineering Mechanics: R.D.Askhedkar & P.B.Kulkarni

Amit

Balaji  
(Ar. Bhambhani)

George  
Dr. M. N. George (B. R. chide)

**Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur**

**Subject: Indian Culture and Constitution (ICC) BSE 2-8 T**

Semester: II

Course: Audit (Non-credit), Total Marks: 50 (Internal)

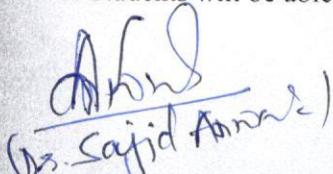
Credit: Nil, Teaching Load: 2(Theory)/week

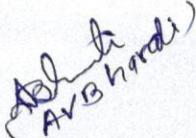
**Course Objective:**

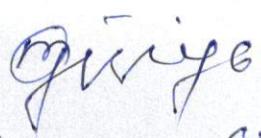
1. To create an understanding of Indian Constitution and develop respect for the same.
2. To create awareness of India as a State Indian culture and Tradition.

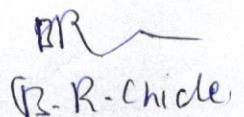
**Course Outcomes:**

1. Students will become aware of Indian culture and civilization and their role in development of society.
2. Students will understand Industrial work-culture.
3. Students will be sensitized towards professional ethics.
4. Students will understand Indian Constitution and governance of the country.
5. Students will be able to understand the structure and system of work organizations.

  
(Dr. Sajid Anwar)

  
(Dr. Avinash)

  
(Dr. Girija)

  
(Dr. R. Chicle)

## SYLLABUS:

### Unit-I

1. Concept of Culture and Civilization
2. Vedic Civilization and Indus Valley Civilization
3. Introduction to Vedas, Ashram system, Varna System
4. Concept of Social Engineering (5 Hours)

### Unit-II

1. Meaning and Scope of Industrial Psychology and Industrial Sociology
2. Recruitment, Selection and Training of Workers,
3. Fatigue in industry.
4. Motives for work in industry (5 Hours)

### Unit-III

1. Sustainable Development
2. Social change .
3. Professional Ethics
4. Concept and styles of Leadership in Industry. (4 Hours)

### Unit-IV

1. Indian Constitution and Federal System
2. Fundamental Rights and Directive Principles of State Policy
3. Role of Bureaucracy in Modern Society
4. Socio-Legal Awareness: Right to Information(RIL), Public Interest Litigation(PIL) (5 Hours)

girija  
Dr. M.W. Girija

(R.R. Chide)

## Unit-V

1. Industrial Democracy
2. Works Organization: Formal and Informal Organization
3. Concept of Power, Authority and Status system;
4. Industrialization, Urbanization and Study of Slums in India . (5 Hours)

## Books Recommended:

- 1) A New Look into Social Sciences- Shabbir, Sheik and Dwadashiwar
- 2) An Introduction to Sociology- Vidya Bhushan and Sachdeva
- 3) Social Science: The Indian Scene-Yogesh Atal
- 4) Applied Humanities-Rajni Tandon
- 5) A History of World Civilizations-J.E.Swain
- 6) Industrial Psychology-Haire Mason
- 7) Introduction to Constitution of India- Durga Das Basu
- 8) Industrial Sociology in India-N.R.Seth
- 9) Human Resource Development and Management- Dr.A.M.Sheikh
- 10) The Economics of Sustainable Development-Surender Kumar

Note: As AICTE has recommended that students of Engineering should learn about Indian Constitution and Indian tradition, we propose above non-credit subject entitled 'Indian Culture and Constitution' to be included in second semester for all branches.

Dr. A. V. Bhardwaj  
(AVB)

Girija  
Dr. M. N. Girija

DR  
(D. R. Chidley)

**RTM Nagpur University  
Syllabus (Practical)**

| Semester                 | Course Title(Subject)                      | Hours / Week |   |   | Credits | Maximum Marks        |                        |       |
|--------------------------|--|--------------|---|---|---------|----------------------|------------------------|-------|
|                          |  | L            | T | P |         | Continual Assessment | University Examination | Total |
| Semester II   First Year | Workshop Practices<br><i>code: BSE2-5P</i> | -            | - | 4 | 2       | 50                   | 50                     | 100   |

**Course Outcomes**

After successful completion of this course the student will be able to:

|     |   |
|-----|---|
| CO1 | Read and interpret job drawing and plan operations  |
| CO2 | Identify and select proper material, tools, equipments, machines and proper operational parameters. |
| CO3 | Set tools, work piece, and machines for desired operations.   |
| CO4 | Complete job of Carpentry, Fitting, Welding and Smithy as per job drawing in allotted time.         |
| CO5 | Use safety equipment and follow safety procedures during operations.                                |
| CO6 | Inspect the job for confirming desired dimensions and shape.  |

**List of Practical's**

| Sr. No. | List of Practical's   |
|---------|---|
| 01      | <b>CARPENTRY SHOP</b> <ul style="list-style-type: none"> <li>• Demonstration of different wood working tools and machines.</li> <li>• Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc.</li> </ul> One simple job involving any one joint like mortise and tenon, dovetail, bridle, half lap etc. (4 Hours of actual working) |
| 02      | <b>FITTING SHOP:</b> <ul style="list-style-type: none"> <li>• Demonstration of different fitting tools and drilling machines and power tools.</li> <li>• Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc.</li> </ul> One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.                                 |
| 03      | <b>WELDINGSHOP :</b> <p>Demonstration of different welding tools / machines.<br/> Demonstration on Arc Welding, Gas Welding, gas cutting.<br/> One simple job involving butt and lap joint. For each students.</p>  |
| 04      | <b>SMITHY SHOP</b> <ul style="list-style-type: none"> <li>• Demonstration of different forging tools and Power Hammer.</li> <li>• Demonstration of different forging processes. likes shaping, caulking fullering, setting down operations etc.</li> <li>• One job like hook peg, flat chisel or any hardware item.</li> </ul>  |

*(Anil Anand)  
 (B. P. Hazari)  
 (R. J. Mehta)  
 (R. R. Mehta)*

**Suggested References:**

- S.K. HajaraChaudhary- Workshop Technology-Media Promtors and Publishers, New Delhi
- B.S. Raghuwanshi- Workshop Technology- DhanpatRai and sons, New Delhi
- H.S.Bawa- Workshop Technology- Tata McGraw Hill Publishers,New Delhi
- Kent's Mechanical Engineering Hand book- John Wiley and Sons, New York
- Electronics Trade & technology Development Corporation.(A Govt. of India undertaking) Akbar Hotel Annex, Chanakyapuri, New Delhi- 110 021
- Learning Materials Transparencies and CDs, CBT Packages developed by N.I.T.T.E.R. and other organizations.

**Notes:**

A journal shall consist of one job assignment each on the topics 1 to 4 mentioned above.

Each assignment shall consist of –

- Procedural steps in completing a given job
- Description and drawings of different tools used
- List of safety equipments used and safety rules observed during working

**Notes:** 1] The subject teacher should provide necessary theory inputs to students of all shops before their actual practical.

2] The instructor shall give demonstration to the students by preparing a specimen job as per the job drawing.

3] The workshop diary shall be maintained by each student duly signed by instructor of respective shop

4] Workshop Tool Manual at institute level shall be provided to the students

5] Distribution of Continuous Assessment marks is as follows:

20 marks for jobs completed (05 marks for each job)+ 05 marks for Practical journal= Total 25 marks

6] University Examination – Performance of any one job as mentioned in list of practical and oral.

Giriya  
Dr. M.N. Giriya

Abdul Basit  
(Ansar Basit)

Ahmed

MR  
(B.R. Chidka)

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY,  
NAGPUR**

**B.E. ELECTRONICS / ELECTRONICS & TELECOMMUNICATION / ELECTRONICS  
& COMMUNICATION ENGINEERING**

**B.E. THIRD SEMESTER**

**Mathematics III**

Subject Code: BEETC-301T/BEEN-301T/BEEC-301T      Credits: 04

Teaching scheme- Lectures (including activity based learning): 3 Hours/ Week

Examination Scheme T (U) : 70 Marks , T (I) : 30 Marks

Duration of University Exam. : 03 Hours

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**Course Objectives:**

*The objective of this course is to provide students with understanding of*

1. A primary objective is to introduce and develop advanced mathematical skills of students that are imperative for effective understanding of engineering subjects.
2. The topics covered will equip them with the techniques to understand advanced level Mathematics and its applications that would enrich logical thinking power.

**Course Outcomes:**

*Upon completion of this course, students will demonstrate the ability to:*

1. Apply Laplace Transform to solve ordinary differential equations, Integral equations and Integro-differential Equations.
2. Apply Fourier series in the analysis of periodic functions in terms sine and cosine encountered in engineering problems and Fourier Transform to solve integral equations.
3. Learn the concept of differentiating, integrating and expanding of analytic functions in complex numbers and their applications such as evaluation of integrals of complex functions.
4. Solve partial differential equations of first order, higher order with constant coefficients and of second order using method of separation of variables.
5. Analyze real world scenarios to recognize when matrices are appropriate, formulate problems about the scenarios, creatively model these scenarios in order to solve the problems using multiple approaches.
6. Understand the impact of scientific and engineering solutions in a global and societal context.
7. Create the groundwork for post-graduate courses, specialized study, and research in mathematics.

**UNIT - I: LAPLACE TRANSFORM (14 Marks)**

Definition, Properties (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform using partial fraction method and properties of Laplace transform, Convolution theorem (Statement only), Laplace transform of periodic

functions (Statement only), Unit step function and unit impulse function (Statement only), Applications of Laplace transform to solve ordinary differential equations, Integral equations & Integro-differential equations

## **UNIT – II FOURIER SERIES & FOURIER TRANSFORM (14 Marks)**

Fourier Series: Periodic functions and their Fourier expansions, Even and odd functions, Change of interval, Half range expansions. Fourier Transform: Definition and Properties (excluding FFT), Fourier integral theorem, Applications of Fourier transform to solve integral equations.

## **Unit III: FUNCTIONS OF COMPLEX VARIABLES (14 Marks)**

Analytic function, Cauchy-Riemann conditions, Harmonic function (Excluding orthogonal system), Milne-Thomson method, Cauchy integral theorem & integral formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and singularities of analytic function, Residue theorem (Statement only).

## **Unit IV: PARTIAL DIFFERENTIAL EQUATIONS (8 Hrs)**

Partial differential equations of first order first degree i.e. Lagrange's form, Linear homogeneous equations of higher order with constant coefficients, Method of separations of variables, Simple applications of Laplace transform to solve partial differential equations (One dimensional only).

## **Unit V: MATRICES (6 Hrs)**

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest eigen value and corresponding eigen vector by iteration method.

### **Text/Reference Books:**

1. Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
2. Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal.
3. Advanced Engineering Mathematics (S. Chand), H. K. Dass.
4. Applied Mathematics for Engineers and Physicists, L. A. Pipes and L. R. Harville.
5. Advanced Mathematics for Engineers, Chandrika Prasad.
6. A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M. Goyal

**B.E. THIRD SEMESTER**  
**COMPONENTS FOR ELECTRONIC CIRCUIT DESIGN**

Subject Code: BEETC-302T/BEEN-302T/BEEC-302T      Credits: 03  
Teaching scheme- Lectures (including activity based learning): 3 Hours/ Week  
Examination Scheme T (U) : 70 Marks , T (I) : 30 Marks  
Duration of University Exam. : 03 Hours

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**Course Objectives:**

*The objective of this course is to provide students with understanding of*

8. To learn the principle of Semiconductor Diodes.
9. To understand the working of different types of Diodes.
10. To study the working of Transistors.
11. To understand the internal structure of MOSFET, JFET and IC Fabrication.

**Course Outcomes:**

*Upon completion of this course, students will demonstrate the ability to:*

CO1: Understand the principles of semiconductor physics

CO2: Understand the principles of semiconductor diode.

CO3:Understand and analyze the mathematical model of transistors.

CO4:Understand and analyze the mathematical model of unipolar transistors.

CO5:Understand the process of Integrated Circuit Fabrication.

**UNIT - I: INTRODUCTION TO SEMICONDUCTOR PHYSICS (14 Marks)**

Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams, Energy bands in metals, insulators, intrinsic and extrinsic semiconductor, Carrier transport: diffusion current, drift current, mobility and resistivity, Generation and recombination of carriers, Poisson and continuity equation

**UNIT- II: P-N JUNCTION DIODE (14Marks)**

P-N Junction, Biasing of diodes, Avalanche &Zener breakdown, I-V characteristics, Transition and Diffusion Capacitance, small signal switching models, Applications of Diode as a Rectifier, Switch, Clipper and Clamper, Zener diode, Zener diode as a voltage regulator, Varactor Diode, LED, Photodiode.

**UNIT- III: Bipolar Junction Transistors (14Marks)**

Zener diode, Zener diode as a voltage regulator, Schottky diode, Avalanche Photodiode, Tunnel Diode, Varactor Diode, LED, Photodiode, PIN Diode, Freewheeling or flyback diode and solar cell.

**UNIT- IV: Unipolar Transistors (14Marks)**

Construction & working of UJT, JFET, JFET parameters, C-V characteristics, Biasing of JFET, Low frequency model of JFET and its analysis. MOSFET (E-type & D-type), I-V characteristics, MOS capacitor and small signal models of MOS transistor.

## **UNIT- V: Fabrication of IC(14Marks)**

Integrated circuit fabrication process: Oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process. sheet resistance, design of resistors.

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

#### **Suggested List**

1. Familiarization with Resistor
2. Familiarization with Capacitor
3. Familiarization with Inductor
4. Ohm's Law
5. VI Characteristics of a Diode
6. Half Wave Rectification
7. Full Wave Rectification
8. Capacitative Rectification
9. Zener Diode-Voltage Regulator
10. BJT Common Emitter Characteristics
11. BJT Common Base Characteristics
12. Studies on BJT CE Amplifier
13. RC Frequency Response
14. RC Differentiator and Integrator
15. Black Box
16. I-V Characteristics and Fabrication of p-n junction Diode
17. I-V Characteristics of LED Diode
18. Rectifier Circuits
19. Wave Shaping Circuits using Diodes

20. BJT characteristics
21. BJT biasing and amplifier response
22. RC circuits
23. Wien Bridge Oscillator
24. Monostable and Astablemultivibrators using IC 555
25. Design and Simulate Analog to Digital Converter and Digital to Analog Converter
26. Implementation of monostable and astable oscillator using IC 555
27. Characterize the temperature sensor (RTD)
28. Simulate the performance of a bio-sensor
29. Measurement of level in a tank using capacitive type level probe
30. Characterize the LVDT
31. Design an orifice plate for a typical application
32. Simulate the performance of a chemical sensor
33. Characterize the strain gauge sensor
34. Characterize the temperature sensor (Thermocouple)
35. Grounding Practices

#### **Web links::**

1. <http://vlabs.iitkgp.ernet.in/be/index.html>
2. <https://ee-iitb.vlabs.ac.in/>
3. <https://slcoep.vlabs.ac.in>List%20of%20experiments.html?domain=Electrical%20Engineering>

#### **Text Books:**

1. J. Millman and Halkias : "Electronic devices and circuits" , TMH Publications
2. Boylestad&Nashelsky : "Electronic Devices & Circuit Theory" , PHI publications.
3. Salivahanan, Suresh Kumar, Vallavaraj: "Electronic devices and circuits", TMH Publications.
4. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson,2014.
5. D. Neamen , D. Biswas, "Semiconductor Physics and Devices," McGraw- Hill Education.

#### **Reference Books:**

1. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
2. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.
3. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.

**B.E. THIRD SEMESTER**  
**COMPONENTS FOR ELECTRONIC CIRCUIT DESIGNLAB**

Subject Code: BEETC-302P/BEEN-302P/BEEC-302P

Credits: 01

Teaching Scheme Practicals: 2 Hours/ Week

Examination Scheme: P (U) :25 Marks , P (I) : 25 Marks

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**Course Objectives:**

To study basic concepts, DC circuits, AC circuits, semiconductors, Semiconductor devices, Power supply, Bipolar and Field effect transistor amplifiers, Frequency response of amplifier.

**Course Outcomes:**

*After completion of the practical:*

1. The students will get the basic concepts of different semiconductor components.
2. They will be able to understand the use of semiconductor devices in different electronic circuits.
3. They will be able to calculate different performance parameters of transistors.
4. They will be able to plot and study the characteristics of semiconductor devices.

**Instructions:**

1. Minimum 9 Practical including one mini project needs to be conducted(In the list given below, wherever a,b,c categories listed can be offered to different groups in the samebatch of practicals).
2. All practicals must be performed on breadboard.
3. One mini project using transistor, MOSFET and general components to be executed on general purpose PCB
4. Minimum 10 viva and tinkering questions to be asked at the end of every experiment. Viva questions should be related futuristic variation in the experiments carried out.
5. Minimum 1 practical to be conducted from every unit.

**List of Experiments:**

1. Familiarization with the Electronic Instruments like function generator, CRO, DC power supply, use of multimeter as voltmeter, ammeter, Ohmmeter, continuity meter, different types of transformers and Centre tapped transformer, Dimmer stat, Rheostat, AC voltage tester, concept of earthing. Measurement of voltage and frequency with CRO and DSO. Concept of saving and accessing waveform on DSO.

2. Familiarization with different types of passive electronic components like resistor, inductor, capacitor. And miscellaneous components like winding wire, Ferrite Cores, connectors, general purpose PCB, and Bread board, relays, diodes, etc.
3. To study basic wiring and design a switchboard/extension board for power distribution of 230V AC and electrical safety, fuses and MCBs, ELCB, contactors etc.
4. To study the concept of phase shift on CRO and DSO and measure phase shift in degrees and radians.
5. Design a a) forward bias circuit of a 1n4001 diode with a DC voltage of 5V and which will provide 5mA current with a suitable series resistor. Find unknown resistor and internal forward resistance of diode using this experiment. Measure forward voltage drop across diode, b)Design a reverse bias circuit of a 1n4001 diode with a DC voltage of 5V. Measure the reverse bias current and find reverse resistance of this diode.
6. Design a a) Half-wave rectifier using a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage. b) Design a Full-wave rectifier using two diodes and a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage, c)Design a Bridge wave rectifier using four diodes and a capacitor-input filter. Use diode 1N4001 and Electrolytic capacitor of 100uF and at 3 different resistive loads. Measure peak to peak ripple voltage. Compare answers with two diode rectifier and half wave rectifier.
7. Design a a)Unregulated power supply of 12V DC using bridge wave rectifier. Ripple voltage should be less than 5mVpp. b) Convert this to regulated power supply using 7812 Linear voltage regulators. Measure efficiency against input supply variation. Plot the graph of efficiency versus input supply variation.
8. Design diode 1N4001 as a positive and negative clipper with a peak to peak voltage of 5Vpp and load resistance of 5kOhms. Use suitable frequency. Plot Waveforms.
9. Design a diode in voltage clamping mode with doubling the voltage for input voltage of 5Vpp and frequency of 50Hz.
10. To determine the operating voltages of different colours of LEDs and measure minimum current and forward bias voltages across them.
11. Design an optocoupler based switching circuit to switch a group of 5 LEDs connected in parallel.

12. To design Transistor as a switch using a driving Relay and switch on and off a 230 V AC/10 W LED Bulb using concept and circuit modification of a) a normally open (N/O) switch(inverter) and b) a normally closed(N/C) switch.
13. To design transistor as an audio amplifier using microphone to amplify different audio frequencies of 20Hz to 20kHz, test it on DSOs and save different pattern of waveforms at different frequencies, Measure its efficiency.
14. To design a) Audio Frequency Oscillator (RC) of 1kHz using transistor by determining values of R and C for a fixed frequency, b)To design Radio Frequency Oscillator of 1MHz (LC) by determining values of L and C for a fixed frequency.
15. To design transistorized AstableMultivibrator for a frequency of 5kHz and 5Vpp.
16. To design a D.C. Power supply of 9V using Full Wave Rectifier of two diodes 1N4007 and suitable Zener Diode. Calculate efficiency.
17. To design an LED blinking circuit using Transistor BC547 and LDR. Use 12V DC power supply for biasing.
18. a)To measure the unknown values of inductors and capacitors using the Voltage divider and AC voltage of 24 V pp and 50Hz frequency, b)To find the value of unknown capacitor using a series RC circuit and AC voltage of 12Vpp and 50Hz, c)To find the value of unknown inductor using a series RL circuit and AC voltage of 12Vpp and 50Hz.
19. a)To use BJT as driver for amplifying switching pulses to 9Vpp at different switching frequencies of 1kHz to 100kHz,b)To use MOSFET as driver for amplifying switching pulses to 12Vpp at different switching frequencies of 1kHz to 100kHz, c)To use IGBT as driver for amplifying switching pulses to 15Vpp at different switching frequencies of 1kHz to 100kHz.
20. To develop an LED blinking of on and off time of 1second each using a charge and discharge concept of RC circuit.

**B.E. THIRD SEMESTER**  
**DIGITAL SYSTEM DESIGN**

Subject Code: BEETC-303T/BEEN-303T/BEEC-303T Credits: 04

Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week

Tutorial: 1 Hours / Week

Examination Scheme T (U): 70 Marks, T (I): 30 Marks

Duration of University Exam. : 03 Hours

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**Course Objectives:**

*The objective of this course is to provide students with understanding of*

1. To study various digital gates and construction of various logic circuits using basic gates.
2. To study combinational circuits.
3. To study Flip flops & its applications.
4. To study fundamentals of microprocessor & to understand the concept of Assembly language programming.
5. To study different interrupt techniques.

**Course Outcomes:**

*Upon completion of this course, students will demonstrate the ability to:*

CO1: demonstrate the knowledge of: Logic gates, Boolean algebra including algebraic manipulation/simplification and Application of DeMorgan's Theorem, Karnaugh map reduction method.

CO2. construct basic combinational circuits and verify their functionalities.

CO3. illustrate and apply the knowledge of different flip flops to build sequential digital circuits.

CO4. interpret different logic families and their characteristics.

CO5. demonstrate and apply programming proficiency using the various addressing modes and instructions of the target microprocessor

**Course Contents**

**UNIT – I: FUNDAMENTALS OF DIGITAL CIRCUIT (14 Marks)**

Number System, Boolean Algebra, Logic Gates and their truth tables, D Morgan's Laws, k-map representation (SOP & POS forms), Minimization of logical functions for min-terms and maxterms (upto 5 variables), Introduction of logic families based on characteristics -Speed of operation, power dissipation, figure of merit, fan in, fan out.

**UNIT- II COMBINATIONAL CIRCUIT (14Marks)**

Arithmetic Circuits, Adders and their use as subtractor, ALU, Digital Comparator, Parity generators/checkers. Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers, Encoders & Decoders. BCD - to – 7 segment decoder, Code converters.

### **UNIT- III: SEQUENTIAL LOGIC DESIGN(14 Marks)**

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops, Registers, Shift registers.

### **UNIT- IV: APPLICATION OF FLIP-FLOP(14Marks)**

Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out.

### **UNIT - V: 8085 PROGRAMMING &INTERRUPTS (14Marks)**

Introduction to Intel's 8085, Architecture-description, Pin description, Addressing Modes. 8085 instruction set, Concept of assembly language programming, Interrupts.

#### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

#### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

#### **Suggested List**

1. Analysis of Functions of BCD-TO-7-segment Decoder / Driver and Operation of 7-segment LED Display
2. Characterization of Digital Logic Families
3. Analysis and Synthesis of Boolean Expressions using Basic Logic Gates
4. Analysis and Synthesis of Logic Functions using Multiplexers
5. Analysis and Synthesis of Logic Functions using Decoders
6. Analysis and Synthesis of Boolean Relations using Digital Comparators
7. Analysis and Synthesis of Arithmetic Expressions using Adders / Subtractors

8. Analysis and Synthesis of Sequential Circuits using Basic Flip-Flops
9. Analysis and Synthesis of Multi-bit Sequential Circuits using Shift Registers
10. Design of Arithmetic Logic Unit (ALU)
11. Washing machine control using basic AND and NOT gates
12. Basics of OR gate and its application in industrial control
13. Basics of NOT gate and its application in an eight bit ones complement circuit
14. Basic NOT gate and its application in fuel level indicator
15. Seat belt warning system using basic AND and NOT gates
16. Basics of AND gate and its application in car wiper control
17. Water level control using basic AND and NOT gates
18. Electronic lock using basic logic gates
19. Universal NAND gate and its application in level monitoring in chemical plant
20. Universal NOR gate and its application in automobile alarm system
21. XOR gate and its application in staircase light control
22. Majority circuit using basic logic gates
23. Cockpit warning light control using basic logic gates
24. DIY Build your own combinational logic circuit using generalized simulator
25. Design of multiplexer circuit using gates
26. Multiplexer using Universal logic gates
27. Demultiplexer using basic logic gates
28. Demultiplexer using Universal logic gates
29. Application of Multiplexer
30. Implementation of 8:1 multiplexer using MSI ICs
31. Design of four variable function using MSI ICs
32. Design of Gray to Binary code converter using MSI ICs
33. Design of Binary to Gray code converter using MSI ICs
34. Implementation of binary adder using MSI ICs
35. Design of binary subtractor using MSI ICs
36. Implementation of 4-bit digital comparator using MSI ICs
37. Design of 8 -bit digital comparator using MSI ICs
38. Construction of half and full adder using XOR and NAND gates and verification of its operation
39. To Study and Verify Half and Full Subtractor
40. Realization of logic functions with the help of Universal Gates (NAND, NOR)
41. Construction of a NOR gate latch and verification of its operation
42. Verify the truth table of RS, JK, T and D flip-flops using NAND and NOR gates
43. Design and Verify the 4-Bit Serial In - Parallel Out Shift Registers
44. Implementation and verification of decoder or de-multiplexer and encoder using logic gates
45. Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates
46. Design and verify the 4- Bit Synchronous or Asynchronous Counter using JK Flip Flop
47. Verify Binary to Gray and Gray to Binary conversion using NAND gates only
48. Verify the truth table of one bit and two bit comparator using logic gates
49. To implement Half adder & Full adder by using basic and universal gates
50. To study Parallel Binary Adder
51. To study a BCD to 7 Segment LED display decoder
52. Study of Binary to Grey code converter
53. Implementation of Boolean Functions using MUX

54. To study the J-K FF and conversion of D and T flip flop to JKFF.
55. To study a simple two-bit ripple counter
56. Design a synchronous up/down counter
57. Design and Implementation of Various Arithmetic Circuits
58. Design and Simulate Various Code Converters
59. Design and Simulation of Various Counters and Shift Registers
60. Design and Simulation of Arithmetic Logic Unit
61. Design and Simulation of Decoders, Encoders, Multiplexer and Demultiplexer

**Web links:**

1. <http://vlabs.iitkgp.ernet.in/dec/index.html#>
2. [http://vlabs.iitb.ac.in/vlabs-dev/labs/digital\\_application/experimentlist.html](http://vlabs.iitb.ac.in/vlabs-dev/labs/digital_application/experimentlist.html)
3. <http://vlabs.iitb.ac.in/vlabs-dev/labs/dldgates/experimentlist.html>
4. <http://vlabs.iitb.ac.in/vlabs-dev/labs/dldesignlab/experimentlist.html>
5. <https://vlab.amrita.edu/?sub=3&brch=81>
6. <https://de-iitr.vlabs.ac.in>List%20of%20experiments.html>

**Text Books:**

1. Morris Mano : “An approach to digital Design”, Pearson Publications.
2. Ramesh Gaonkar : “ Microprocessor Architecture, Programming and Applications with the 8085”, Penram International Publications.
3. R. P. Jain : “Modern digital electronics” , TMH Publications.

**Reference Books**

1. WakerlyPearon : “Digital Design: Principles and Practices”, PearsonEducationPublications.
2. Mark Bach : “Complete Digital Design”, Tata MCGraw Hill Publications.
3. W. Fletcher : “Engg. Approach to Digital Design”, PHI Publications.

**B.E. THIRD SEMESTER**  
**DIGITAL SYSTEM DESIGNLAB**

Subject Code: BEETC-303P/BEEN-303P/BEEC-303P      Credits: 01  
Teaching Scheme Practicals: 2 Hours/ Week  
Examination Scheme P (U):25 Marks, P (I):25 Marks

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**Course Objectives:**

*The course objectives are:*

1. To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.
2. To perform a practical based on microprocessor.

**Course Outcomes:**

*After the completion of practicals, the students will*

1. Demonstrate the different Boolean Laws & basics of K-map to realize combinational & sequential circuits.
2. Identify the various digital ICs & understand their operation.
3. Describe the operation & timing constraints for latches, registers, different sequential circuits.
4. Solve basic binary math operations using microprocessor & explain the internal architecture & its operation within the area of manufacturing & performance.
5. Select programming strategies & proper mnemonics & run their program on the training boards.

**NOTE:**

1. All experiments need to be conducted on breadboard. No readymade kits should be used. Total 9 experiments including one mini project needs to be conducted.
2. Use LEDs, breadboard, and 5V to 12V power supply for all digital experiments
3. Minimum 6 experiments needs to be conducted from hardware list
4. Minimum 2 experiments to be conducted on Microprocessor 8085
5. Minimum one mini project on general purpose PCB/etched PCB to be conducted

**List of Experiments:**

1. To verify NAND(IC 4011) & NOR(IC 4001) gates as a universal gate.
2. Implementation of the given Boolean function using logic gates in both Sum of products (SOPs) and Product of Sum (POS) forms.
3. Design and implementation of code converters using Logic gates.
4. To design and verify operation of half adder and full adder(IC CD 4008).
5. Implementation of 4-bit parallel adder using CD 4008 IC.
6. Implementation and verification 16:1 multiplexer using 8:1 Mux(CD 4051) and 2:1 Mux
7. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
8. To explore 4 bit ALU(CD 40181) and verify its function table
9. Verification of state tables of RS, JK, T and D flip-flops using NAND(IC 4011) & NOR(IC 4001) gates.

10. Design and implement the sequential circuits such as registers and sequence generator.
11. Simplification and implementation of a Boolean function using k -map technique
12. Design and implementation of Binary,BCD adders and Subtractor using IC 4008 and gates
13. Design and implementation binary and BCD comparator using of using CD 4063
14. Parity generator and checker using X-OR gate(CD 4070)
15. Design and implementation of ripple and synchronous counters using JK(CD 4027) and D FF(CD 4013) and additional gates
16. Design of counter using ICs like 4029 (ripple) and CD 40192(synchronous)
17. Design and implementations of random sequence counter using JK(CD 4027) and D FF(CD 4013) ICs
18. Study of shift registers CD 54HC194 for different modes.
19. Study of characteristics of typical TTL and CMOS IC's like fan out, noise margin, propagation delay
20. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
21. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
22. To find the largest and smallest number in an array of data using 8085 instruction set.

#### **MINI PROJECT: -**

Design of a 230 V AC on off circuit for a 10W LED bulb using a single pushbutton, 2 push buttons. Automatically this light should be switched off after a duration of 30 second using any digital IC concept. Use any components, relay or resistors.

## B.E. THIRD SEMESTER

### Network Theory

Subject Code: BEETC-304T/BEEN-304T/BEEC-304T      Credits: 03  
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week  
Examination Scheme T(U) : 70 Marks , T (I) : 30 Marks  
Duration of University Exam. : 03 Hours

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#### **Course Objectives:**

*The objective of this course is to provide students with understanding of*

1. Various methods of analysis of electric networks under transient and steady state conditions.
2. Concrete foundation needed to learn future professional courses.

#### **Course Outcomes:**

*Upon completion of this course, students will demonstrate the ability to:*

1. Apply mesh and node voltage method to model and analyze electrical circuits.
2. Apply network theorems for the analysis of networks.
3. Obtain the transient and steady-state response of electrical circuits.
4. Synthesize waveforms and apply Laplace transforms to analyze networks.
5. Evaluate different Network Functions and Analyze two port network behavior

#### **UNIT - I: Sources and Mesh Analysis (14 Marks):**

Voltage, Current sources, source transformation and reduction, mesh basis equilibrium approach for complicated network containing independent sources and reactances.

#### **Node Voltage Analysis (5 hours):**

Nodal Basis equilibrium equation, matrix for electrical network containing independent sources and reactances. Duality.

#### **UNIT- II: Network Theorems (14 Marks):**

Superposition, Thevenin's, Norton's, Maximum Power transfer, Reciprocity, Tellegen's theorem as applied to A. C. & D. C. circuits (problems with dependent sources are also to be dealt)

#### **UNIT- III: Solution of First and Second order Networks (14 Marks):**

Solution of first and second order differential equations of different combinations of series and parallel RLC networks, initial and final conditions in network elements, free and forced response, time constants.

#### **UNIT- IV: Electric Circuit Analysis using Laplace Transforms (14 Marks):**

Review of Laplace transform, waveform synthesis, Analysis of electrical circuits using Laplace transform for standard inputs, analysis of networks with and without initial conditions using Laplace transforms.

#### **UNIT- V: Two port networks and Network functions (14 Marks):**

Two port networks, relationship between two port variables, driving point and transfer functions, properties, concept of complex frequency, Poles and zeros, evaluation of response from pole zero locations.

**Two port network parameters:** Impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnection of two port networks.

**Text Books:**

1. Van Valkenburg, "Network Analysis", Third Edition, 2009, Prentice Hall of India
2. Sudhakar, A, Shyammohan, "Circuits and Networks", Third Edition, 2006, Tata McGraw-Hill.
3. D. Roy Choudhary, "Networks and Systems", New Age International Publishers, 2<sup>nd</sup> Edition, 2012
4. Kelkar and Pandit, "Linear Network Theory", Pratibha Publications.

**Reference Books:**

1. MahmoodNahvi, Joseph A Edminister, "Schaum's outline of Electric Circuits", 6<sup>th</sup> Edition, Tata McGraw-Hill, 6<sup>th</sup> Edition, 2013
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
3. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
4. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.
5. K. Sureshkumar, "Electric Circuits & Network", Pearson Publication
6. Del Toro, "Electrical circuit", Prentice Hall

## **B.E. THIRD SEMESTER**

### **SIGNALS AND SYSTEMS**

Subject Code: BEETC-305T/BEEN-305T/BEEC-305T      Credits 03  
Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week  
Examination Scheme T(U) : 70 Marks , T (I) : 30 Marks  
Duration of University Exam. : 03 Hours

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#### **Course Objectives:**

*The objective of this course is to provide students with understanding of*

1. To introduce the fundamentals, basic characteristics, concept techniques of signals & systems.
2. Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
3. Development of the mathematical skills like Fourier series, Fourier transforms, Random theory to solve problems involving convolution, filtering, modulation and sampling.

#### **Course Outcomes:**

*Upon completion of this course, students will demonstrate the ability to:*

CO1: Classify different types of signals and systems

CO2: Illustrate the concept of Linear Time Invariant (LTI) system and its properties.

CO3: Analyze continuous time periodic and aperiodic signals.

CO4: Analyze continuous time systems using Laplace Transform.

CO5: Analyze DT signals and systems in frequency domain using Fourier Transform.

#### **Course Content:**

#### **UNIT - I: CLASSIFICATION OF SIGNALS AND SYSTEMS (14 Marks)**

Standard signals: Step, Impulse, Ramp, Real & complex exponentials,sinusoidal. Classification of signals: Continuous time(CT) and Discrete Time (DT) signals, Periodic and aperiodic signals, Deterministic and random signals, Energy and power signals.

Sampling: Introduction, Need for perfect reconstruction, Sampling theorem, Nyquist rate of sampling, zero order hold and first order hold. Classification of Systems: Continuous time and Discrete time, Static and dynamic, Linear and nonlinear, Time-variant and Time-invariant, Casual and non-causal, Stable and unstable, Invertible and Inverse system.

#### **UNIT- II: LINEAR TIME-INVARIANT SYSTEMS (14Marks)**

Introduction, Continuous-Time LTI systems: The Convolution Integral, Properties of Linear Time Invariant systems, LTI Systems with and without memory, Invertibility of LTI systems,

Causality for LTI systems, Stability for LTI systems, The unit step response of an LTI system, Block diagram representations of first-order systems described by differential equation

### **UNIT- III: ANALYSIS OF CONTINUOUS TIME PERIODIC AND APERIODIC SIGNALS (14Marks)**

Fourier Series: Trigonometric Fourier Series, Exponential Fourier Series, Fourier Transform Properties: Linearity, Time Shifting, Time and frequency scaling, Duality, Multiplication property, Differentiation and Integration, Convolution property. Parseval's relation.

### **UNIT- IV: Laplace Transform (14Marks)**

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis of LTI systems.

### **UNIT- V: DISCRETE TIME FOURIER TRANSFORM (DTFT) (14Marks)**

Introduction, Representation of aperiodic Signals: The Discrete-Time Fourier Transform, The Fourier Transform of periodic signal, Properties of Discrete-Time Fourier Transform, Frequency response of discrete time LTI systems.

#### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

#### **Activity Based Learning**

##### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

#### **Suggested List**

1. Exp-1 Signals and their properties

Demonstration of different signals and their properties. There are FIVE sub-experiments within this experiment.

2. Exp-2 System and their property

Demonstration of Salient properties systems. There are THREE sub-experiments within this experiment.

3. Exp-3 Fourier analysis of signals

Analysis of Fourier properties of Signals. There are SIX sub-experiments within this experiment.

4. Exp-4 Sampling and signal reconstruction.

Demonstration of sampling/ reconstruction of signals and spectral analysis using DFT. There are FIVE sub-experiments within this experiment.

5. Exp-5 Analysis of LTI system response.

- Convolution and correlation of signals.
- Study of sampling theorem, effect of undersampling
- Study of properties of Linear time-invariant system.
- Study of Discrete Fourier Transform (DFT) and its inverse
- Study of Transform domain properties and its use

**Web links:**

1. <https://vlab.amrita.edu/?sub=3&brch=81>
2. [http://ssl-iitg.vlabs.ac.in/Signal%20and%20their%20properties%205\(theory\).html](http://ssl-iitg.vlabs.ac.in/Signal%20and%20their%20properties%205(theory).html)
3. <http://vlabs.iitkgp.ernet.in/dsp/index.html#>

**Text Books:**

1. Signals and Systems, A. Anand Kumar, PHI Learning Private Limited.
2. Oppenheim, Wilsky, Nawab, "Signals and Systems", Person Education Publications
3. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.

**Reference Books**

1. Simon Haykin, Barry Wan Veen : "Signals and Systems", John Wiley and Sons Publications.
2. K.Lindner, "Signals and Systems", McGraw Hill International, 1999.
3. B.P. Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, c1998
4. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing", 4th Edition, Pearson Prentice Hall, c 200

**B.E. THIRD SEMESTER**  
**MEASUREMENTS AND INSTRUMENTATION**

Subject Code: BEETC-306T/BEEN-306T/BEEC-306T      Credits 03  
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week  
Examination Scheme T (U): 70 Marks , T (I): 30 Marks  
Duration of University Exam. : 03 Hours

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**Course Objectives:**

*The objective of this course is to provide students with understanding of*

1. Necessary foundation of electronic measurement techniques and its use for voltage, current, power, energy, frequency & time measurement.
2. Working principle and use of moving coil instruments for measurements of voltage, current, power, energy etc.
3. Understanding application of bridges in resistance, capacitance and Inductance measurement and their use in real life industrial applications.
4. Knowledge of working principle of various instruments like CRO, DSO, LCR, and Spectrum Analyzer for testing and measurement. Upon completion of this course, students will demonstrate the ability to:

**Course Outcomes:**

CO1: Select and use precise/accurate instrument for measurement of various electrical Parameters and to Understand its technical specifications.

CO2: Identify and minimize errors in electrical/electronic measurement.

CO3: Select suitable transducer for measurement of physical parameters.

CO4: Interpret the data using statistical analysis.

CO5: Understand modern trends in data acquisition systems

**Course Content:**

**UNIT – I: REVIEW OF INDICATING, INTEGRATING INSTRUMENTS and INSTRUMENTATION: (14 Marks)**

Purpose of instrumentation, Basic elements of instrumentation, Statistical analysis and measurement of errors, Principle and operation of ammeters, voltmeters and wattmeters, moving iron and moving coil, dynamometer, Multimeter and Energy Meter. Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermisters, thermocouples, photo-diodes,photo-transistors encoder type digital transducers, signal conditioning and Data Acquisition Systems.Sensors for measurement of Liquid level, Gas flow, liquid flow, Pressure, Humidity, Temperature, Vibration, Acceleration etc.

**UNIT – II: DETECTORS AND BRIDGES: (14 Marks)**

PMMC galvanometer, dc & ac voltmeter, ammeter, multimeter, watt-hour meter, three phase wattmeter, power factor meter, instrument transformers. Measurement of low, medium and high resistance. General Balance Equation; Circuit diagram; Phasor diagram and Advantages as well as Disadvantages and Applications of Wheat stone, Kelvin, Max-well, Hay, Schering, Weinbridge Potentiometers, Measurement of Inductance, capacitance using AC bridges like Anderson, Ownens; DeSauty's. Shielding and earthing.

### **UNIT – III: ANALOG/ DIGITAL MEASUREMENT SYSTEMS: (14Marks)**

Signal conditioning measurement meters, Electronic multimeter, Q-meter, RF power and voltage measurements. Measurement of Energy- A.C. single phase and poly-phase induction type energy meters. Oscilloscope: Digital storage oscilloscope – 2 and 4 channel, delay line, multiple trace, Triggering, delayed sweep. HMI systems for SCADA,

### **UNIT – IV: FREQUENCY AND POWER MEASUREMENT: (14Marks)**

Frequency, and Time measurement, signal analysis. frequency counters – measurement of frequency and time interval – extension of frequency range. Function generators – RF signal generators – Sweep generators – Frequency synthesizer –wave analyzer – Harmonic distortion analyzer – spectrum analyzer, Recent trends/developments.

### **UNIT V: TELEMETRY SYSTEMS: (14Marks)**

What Is Telemetry? How Telemetry Works, Benefits of Telemetry, Challenges. Learn by exploring some of the tutorials on following platforms -

- Windows Azure: Telemetry Basics and Troubleshooting
- Instrumenting Your App for Telemetry and Analytics
- Software Project Telemetry
- Telemetry Dashboard Documentation – Mozilla
- Building a Scalable Geolocation Telemetry System in the Cloud using the Maps API

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.

5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

### **Suggested List**

1. Measurement of Capacitance by Carey Foster Bridge
2. Measurement of Self Inductance of High Quality Factor Coil by Hay's Bridge
3. To study the Kelvin Double Bridge for Low resistance measurement
4. Measurement of Self Inductance by Maxwell's Bridge
5. Q meter Experiment
6. Measurement of Capacitance by Wien Series Bridge
7. Measurement of Capacitance by De Sauty's (Modified) bridge
8. Measurement of Self Inductance by Owen Bridge
9. Measurement of Self-Inductance by Maxwell Bridge
10. Measurement of Capacitance by Schering Bridge
11. Measurement of Self Inductance accurately by Anderson's Bridge
12. To determine the High Resistance by Megohm Bridge method
13. To study the Wien Robinson's Frequency Bridge
14. To find Galvanometer Constant
15. Mutual Inductance measurement by Campbell's Modification of Heaviside Bridge
16. Precision Resistance Measurement by Carey Foster Slide-Wire Bridge
17. Mutual Inductance measurement by Heydweiller Bridge
18. Verification of Reciprocity Theorem
19. Verification of Maximum Power Transfer Theorem
20. Determination of different parameters of Two-port network and verification of their interrelations. Frequency Response of 2nd order Active Filters
21. Estimation of Fourier Coefficients of a Periodic Signal through passive Network
22. Verification of Norton Theorem
23. Verification of Thevenin Theorem
24. Verification of Tellegen's Theorem
25. Verification of Superposition Theorem
26. Verification of Millman's Theorem
27. Three Phase Power Measurement
28. R-L-C Circuit Analysis
29. Tests on Single Phase Transformer
30. Verification of Compensation Theorem

### **Web links:**

1. <http://vlabs.iitkgp.ernet.in/asnm/index.html#>

### **Text Books:**

1. Electrical Measurement: A.K.Sawhney, DhanpatRai& Sons Publication, 11 Edition

2. Electronic Measurement Systems, 2nd revised edition, 2009: U. A. Bakshi, A. V. Bakshi, K. A. Bakshi, Technical Publications Pune

**Reference Books:**

1. Electronic Instrumentation & Measurement Technique: W. D. Cooper & A.D. Helfrick., 3rd Edition

**B.E. THIRD SEMESTER**  
**ELECTRONICS WORKSHOP I**

Subject Code: BEETC-307P/BEEN-307P/BEEC-307P      Credits 01

Teaching Scheme Lectures: 2 Hours/ Week

Examination Scheme P (U): 25 Marks, P (I): 25 Marks

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**Objectives:**

To study basic concepts, of all active, passive components, sensors, actuators, and different types of Electronic components used DC circuits, AC circuits, semiconductors, Semiconductor devices, Power supply, Bipolar and Field effect transistor amplifiers, Frequency response of amplifier.

**Course Outcome:**

*After completion of the practical the students will be able to*

1. Get The Basic Concepts Of Different Semiconductor Components With Their Usage Physically As Per Their Types
2. Use of Semiconductor Devices In Different Electronic Circuits And Projects.
3. Calculate Different Performance Parameters of Active and Passive Devices and their Datasheets.
4. Plot and Study the Characteristics of Semiconductor Devices.

**Instructions:**

**Methodology**

- a. In each turn it is expected that students will handle all types of components mentioned for that term.
- b. Teacher will give simple masked circuit diagram with description to the group of students and ask them to generate the bill of material by doing the design calculations. Teacher will guide how to do the calculations.
- c. Teacher will take viva on the content which is covered.
- d. In the 9th turn of practical, students will execute the mini project.
- e. A detailed instructional manual will be provided to all teachers and students regarding its step by step execution.

**List of Experiments:**

1. Study of Resistors (All types and their applications)
2. Study of Capacitors (All types and their applications)
3. Study of Inductors (All types and their applications)
4. Study of Diodes-(All types and their applications)
5. Study of Transistors/ MOSFETs/IGBTs
6. PCB Designing on software
7. Study of Photodiodes/Phototransistor

8. Study of Optocoupler
9. Study of Solar Cell
10. Study of Sensors/Encoders/Accelerometer
11. Study of Actuators
12. Study of All kinds of motors like DC motor/Induction motors.
13. Study of Stepper Motors and their drives.
14. One mini Project on above experiential learning.

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY,  
NAGPUR**

**B.E. ELECTRONICS / ELECTRONICS & TELECOMMUNICATION / ELECTRONICS  
& COMMUNICATION ENGINEERING**

**SYLLABUS**

**B.E. FOURTH SEMESTER**

**MICROCONTROLLER AND APPLICATIONS**

Subject Code: BEETC-401T/BEEN-401T/BEEC-401T Credits: 04

Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week

Tutorial: 1 Hours / Week

Examination Scheme T (U): 70 Marks, T (I): 30 Marks

Duration of University Exam. : 03 Hrs

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**Course Objectives: -**

*The objective of this course is to provide students with understanding of*

1. To study and understand architecture of microcontrollers and its programming concept.
2. To understand the interrupt mechanism, PPI and I/O devices interfacing and its programming.
3. To study and impart different programming languages & tools for design of embedded systems.
4. To gain knowledge about advanced processors/controllers like ARM, PIC, MSP-430 etc.
5. To learn about Arduino platform for designing embedded system applications.

**Course Outcomes: -**

*Upon completion of this course, students will demonstrate the ability to:*

C01: Demonstrate the programming model of various microcontrollers.

C02: Design and implement 8051 microcontroller-based systems for various applications

C03: Illustrate & program AVR / RISC microcontrollers in Integrated Development environment.

C04: Design and implement advanced processor/controllers-based systems for various applications

C05: Design and develop Arduino based embedded system applications.

**Course Contents:**

**UNIT I: INTRODUCTION TO MICROCONTROLLERS: (14 Marks)**

Overview of MC-51 family, Architecture and Programming Model of 8051, Instruction Set, Assembly Language Programming, Stack, Interrupt , Timers, Serial Communication, SFRs, PPI and Port Programming.

## **UNIT II: Applications of 8051 Microcontroller(14Marks)**

Interfacing and Programming of - Memory, LED / LCD Display, Keyboard, Stepper & DC Motor, A/D and D/A. Introduction to CAN, Bluetooth and USB protocols and its interfacing, Water Level Controller

## **UNIT III: Integrated Development Environment (IDE) for Microcontrollers (14 Marks)**

Editor, linker, Loader, Debugger, Simulator and Emulator. Instruction Set and Formats, Assembler Directives, Addressing Modes of AVR Microcontroller. Basic programming using AVR assembly instructions. Introduction to Embedded- C, Integrated Development Environment (IDE), cross compiler, ISP, simple program for delay generation.

## **UNIT IV: INTRODUCTION TO OTHER ADVANCED MICROCONTROLLERS (14 Marks)**

Introduction to ARM and PIC Processors of MSP 430 Microcontroller, 16 bit Micro-controllers overview; features, Architecture, Addressing Modes. Low power feature of MSP 430.

## **UNIT V: INTRODUCTION TO ARDUINO: (14Marks)**

Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board, Introduction to Embedded C and Arduino platform.

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

## **Activity Based Learning**

### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs.
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers.
4. At least 10 activities to be conducted in every course in classroom.
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

### **Suggested List:**

1. LCD - MCU interfacing and displaying a string
2. MCU interfacing take a input from keypad and display on LCD
3. Stepper Motor Control Using ATMEGA-16 Microcontroller
4. Interface a LED matrix and display a number on the matrix.
5. Interfacing 4x4 switch matrix with the microcontroller
6. Implementation of Digital FIR Filter on 8051 Microcontroller
7. Serial Communication between micro controller and PC
8. Temperature control using ATmega16
9. Study hardware and software platforms for DCS
10. Simulate analog and digital function blocks
11. Study, understand and perform experiments on timers and counters
12. Logic implementation for traffic Control Application
13. Logic implementation for Bottle Filling Application
14. Tune PID controller for heat exchanger using DCS
15. FBD for autoclavable laboratory fermenter
16. Develop graphical user interface for the fermenter plant

#### **Web links:**

1. <http://vlabs.iitkgp.ernet.in/rtes/index.html#>
2. <http://ial-coep.vlabs.ac.in>List%20of%20experiments.html>

#### **Text Books**

1. The AVR Microcontroller and Embedded Systems: A System Approach by Muhammad A. Mazidi, 1st Ed., PHI, 2013.
2. Kenneth J. Ayala, "The 8051 Microcontroller", Penram International Publishing, 1996.
3. Embedded C Programming and the ATMEL AVR by R H Barnett 2nd Ed., Cengage Learning Publication, 2006.

#### **Reference Books:**

1. The 8051 Microcontroller: A System Approach by Muhammad Mazidi, 1st Ed., PHI, 2012
2. D. M Calcutt, Fredrick J. Cowan " 8051 microcontroller: an application based introduction".
3. SubrataGhoshal "8051 microcontroller" Pearson Education

**B.E. FOURTH SEMESTER**  
**MICROCONTROLLER AND APPLICATIONSLAB**

Subject Code: BEETC-401P/BEEN-401P/BEEC-401P      Credits: 01  
Teaching Scheme Practicals: 2 Hours/ Week  
Examination Scheme P (U): 25 Marks, P (I): 25 Marks

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**Course Objectives:**

*The course objectives are:*

1. To perform a practical based on different microcontroller based systems.
2. To study assembly language programming skills.
3. Interface different peripherals with microcontrollers [for its practical use](#).

**Course Outcomes:**

*After the completion of practicals, the students will*

1. Demonstrate the concept of Assembly languages and higher level language programming.
2. Interface various peripherals with 8051, Atmega 32, MSP 430 and Arduino.
3. Simulate the programs on different software platforms.

**Instructions-**

1. Minimum 9 experiments including one mini project needs to be conducted
2. Conduct at least 2 experiments on general assembly language programming of microcontroller 8051
3. Conduct at least 1 experiment on interfacing based circuits using microcontroller 8051
4. Conduct at least 2 experiments on AVR Atmega 32 microcontroller
5. Conduct at least 2 experiments on MSP 430 microcontroller
6. Conduct at least 1 experiments on Arduino microcontroller
7. One miniproject needs to be compulsorily developed using any microcontroller on etched PCB

**List of Experiments**

1. Write and execute ALP for 8051 to convert two digit decimal numbers present in external data memory into its equivalent ASCII code.
2. Write and execute ALP for 8051 to swap nibbles of 10 bytes present in external data memory.
3. Write an ALP for 8051 to finding the smallest and largest number from given data bytes stored in internal/external data memory location
4. Write and execute ALP for 8051 to exchange two data strings present in external data memory.
5. Write and execute an ALP for 8051 to exchange the data of two memory location.
6. Write and execute ALP for 8051 to convert two digit decimal number present in external data memory into its equivalent ASCII code.
7. Write a 8051 assembly language program to copy a data from DATA space( internal Ram) into the EXTERNAL memory space starting at address 8000H.

8. Assume that 5 BCD data items are stored in RAM locations starting at 40H. Write a 8051 assembly language program to find the sum of all the numbers. The result must be in BCD.
9. Write a 8051 assembly language program to find largest no. of given 10 bytes of data stored in memory location 5000H
10. MCU 8051 Timer interrupt programming using Timer0 model for blinking LED using interrupt
11. Interface 8 LEDs with 8051 and write a program to glow alternate LEDs. Modify the experiment further to blink an LED lamp of 230V AC/10W with an on and off time of 1 Second
12. Interface microcontroller 8051 with LCD display and display a string of "Welcome to microcontroller Programming" and a table of 5
13. Design an interfacing of seven segment display with microcontroller 8051 and generate all numbers from 0 to 9 with a time duration of 1 second.
14. Interface Microcontroller 8051 with DAC and generation of triangular wave of frequency 10kHz triggering through timer (on chip timer)
15. Design a Stepper Motor Controller Using 8051 Microcontroller. Rotate this motor with an RPM of 150 both in clockwise and anticlockwise directions
16. Design an MCU AVR Atmega32 interfacing with LCD and displaying string and table of 5. Modify this program to interface LM 34 for displaying temperature in Degree Centigrade and Fahrenheit on LCD display.
17. Write and execute ALP for AVR Atmega32 to generate square wave of 1kHz frequency on any one of the pin of output port. Modify this experiment further to generate pulses of different duty ratios starting from 10% to 90 %.
18. Interface stepper motor with AVR Atmega 32 microcontroller and write a program to rotate in clockwise and anticlockwise direction at a speed of 150 RPMs
19. Design a water level controller using AVR Atmega 32 in a) timer mode of operation and sensor mode of operation(I/O programming)
20. Design an interfacing of alphanumeric display with AVR Atmega 32 and generate all numbers from 0 to 9 and all letters from A to Z with a time duration of 1 second.
21. Establish Serial Communication between two MSP 430 microcontrollers
22. Write a program to interface an LED to the port 2 of MSP 430 microcontroller. Use both conditions of active low and active high in program.
23. Write a program to generate PWM pulses of 1kHz using MSP 430 microcontroller at a varying duty cycle of 10 % to 90 %.
24. Interface MSP 430 microcontroller with a matrix keyboard and display different characters on LCD
25. Using Arduino interrupt programming concept, interface a push button switch with it and switch on and off an LED lamp of 230V AC/10 W.
26. Design a PWM speed control system of 12V DC motor using Arduino and run it at a speed of 10 % to 100%..
27. Write a program to generate saw tooth waveform of frequency 1kHz with Arduino.
28. Design a traffic light controller using Arduino in timer mode for four roads. Use 3 LEDs, Red, Green and Yellow in each direction.

**B.E. FOURTH SEMESTER**  
**ANALOG AND DIGITAL COMMUNICATION**

Subject Code: BEETC-402T/BEEN-402T/BEEN-402T      Credits 04  
Teaching Scheme Lectures (including activity based learning): 3 Hours/ Week  
Examination Scheme T (U): 70 Marks, T (I): 30 Marks  
Tutorial: 1 Hours / Week  
Duration of University Exam. : 03 Hrs

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**Course Objectives: -**

*The objective of this course is to provide students with understanding of*

1. The basic principles and techniques used in analog and digital communications.
2. Analog and digital modulation techniques, communication receiver and transmitter design, baseband and band pass communication techniques, line coding techniques, noise analysis, and multiplexing techniques.
3. Analytical techniques to evaluate the performance of communication systems.

**Course Outcomes: -**

*Upon completion of this course, students will demonstrate the ability to:*

CO1: Demonstrate a basic need of modulation and various types of amplitude and angle modulation techniques required for analog communication.

CO2: Analyze various AM-FM receivers, along with the effect of noise on analog communication systems.

CO3: Explain the designing of digital communication systems by applying knowledge of the various pulse modulation techniques.

CO4: Describe various digital modulation techniques and various parameters associated withit.

CO5: Identify different types of channel coding techniques and analyze the different spread spectrum methods.

**UNIT I: AMPLITUDE MODULATION: (14Marks)**

Need for modulation, Amplitude Modulation (AM), DSBSC, SSB, VSB and ISB transmissions, mathematical Analysis, modulation index, frequency spectrum, power requirement of these systems, AM Generation: Generation of DSBFC - Plate Modulated Class-C Amplifier. Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Generation of FM (Direct & Indirect Method), Comparison of FM and PM. Pre-emphasis and De-emphasis.

## **UNIT II: AM & FM RECEIVERS: (14Marks)**

AM Detection: Demodulation of DSBFC – Square Law Detector, Envelope Detector, Demodulation of DSBSC - Synchronous Detector, Demodulation of SSBSC. FM Receivers: Super-heterodyne Receiver: Block Diagram, Performance Characteristics - Sensitivity, Selectivity, Fidelity, Foster Seeley FM Discriminator .Types of Noises. Signal to Noise Ratio. Noise Figure.

## **UNIT III: DIGITAL COMMUNICATION : (14Marks)**

Sampling theorem, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Analog modulation: PAM PWM & PPM.

PCM – Generation & reconstruction, Bandwidth requirement of PCM. Differential PCM, Delta Modulation & Adaptive DM. Companding in PCM.

## **UNIT IV: DIGITAL MODULATION TECHNIQUES: (14Marks)**

Introduction to Digital Modulation Techniques ASK , PSK, FSK,QPSK, MSK, DPSK, OFDM. Introduction to information theory, channel capacity, Huffman, Prefix code, and LZ encoding algorithm. Rate distortion theory for optimum quantization, scalar and vector quantization.

## **UNIT V: REVIEW OF CHANNEL CODING AND SPREAD SPECTRUM: (14Marks)**

Linear block codes, cyclic codes convolution encoding and decoding,Viterbi algorithm and Fano algorithm. Trellis coded modulation methods. Study of PN sequences, direct sequence methods, slow and fast Frequency hop methods. Application of spread spectrum, CDMA.

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers
4. At least 10 activities to be conducted in every course in classroom
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

### **Suggested List**

1. To calculate modulation index by observation of AM wave
2. To study quantization
3. To study sampling theorem
4. To perform Lempel-Ziv encoding and decoding.
5. To perform convolution encoding and decoding.
6. Simulation of a Satellite Network

Satellite | Simulating a Satellite network in ns2 | Geostationary satellite nodes | Terminal nodes | Polar orbiting satellite nodes(Non-geostationary satellite) | Satellite links | Handoffs | Routing | Structure of trace files in Satellite network

#### 7. Simulating a Wi-Fi Network

Wi-Fi Networks | IEEE 802.11 Standards | Hardware Requirements for Wi-Fi | How to connect to the Wi-Fi Networks? | Advantages of Wi-Fi | Limitations | MAC Protocols | Use of RTS/CTS to Exchange Data | Issues in Wi-Fi Networks | The Hidden Terminal Problem | Solution of Hidden Terminal Problem | Exposed Terminal Problem | Solution to the Exposed Terminal Problem | Simulating a Wi-Fi using Network Simulator 3

#### 8. Simulating a Wireless Sensor Network

Wireless Sensor Networks | Basic Characteristics of WSNs | Operating Systems for WSNs | Differences with Mobile Ad hoc Networks | Types of Wireless Sensor Networks | Routing protocols for WSNs | Clusters and Cluster heads in WSNs | The LEACH Protocol | Operation of LEACH | Discussions on LEACH | Applications of WSNs | Simulating a WSN using Network Simulator 2

#### 9. Setting up a Bluetooth Network

Bluetooth Network | Who started Bluetooth ? | Bluetooth vs Wi-Fi | Bluetooth – Power Classes | Bluetooth - Versions | How does Bluetooth work ? | Networking of Bluetooth | How to connect Bluetooth ? | Simulating Bluetooth Network with NS-2

#### 10. Setting up a ZigBee Network

ZigBee Network | IEEE 802.15.4 and ZigBee | ZigBee vs. Bluetooth | Features & Characteristic of ZigBee Technology | Application of ZigBee Technology | Component of IEEE 802.15.4 LR-WPAN | Network Topologies | ZigBee Architecture | The Superframe structure | Nodes Configuration | Energy Model

#### **Web links:**

1. <https://vlab.amrita.edu/index.php?sub=59&brch=163>
2. <http://vlabs.iitkgp.ac.in/ant/>

#### **Text Books**

1. Communication Systems - B.P Lathi, BS Publication
2. Lathi B.P. - Modern Digital and Analog communications systems - PRISM Indian Ed.
3. Simon Haykin, "Digital Communication Systems", John Wiley&Sons,

#### **Reference Books:**

1. P Ramkrishna Rao, Digital Communication, McGraw-Hill Publication
2. J.G. Proakis, Digital Communication.
3. S. Haykin, Communication Systems
4. Leon W. Couch: Analog/Digital Communication, 5<sup>th</sup>Edition, PHI,2008

## B.E. FOURTH SEMESTER

### Analog and Digital Electronics Lab

Subject Code: BEETC-403P/BEEN-403P /BEEC-403P Credits 01

Teaching Scheme Lectures: 2 Hours/ Week

Examination Scheme P (U): 25 Marks, P (I): 25 Marks

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#### Course Objectives:

*The course objectives are:*

1. To impart practical concepts of different analog and digital electronics circuits
2. To understand the basic fundamentals of analog and digital circuits.

#### Course Outcomes:

*After the completion of practicals, the students will*

1. Study the practical aspects of linear and non-linear applications of OP-AMP.
2. Design the various wave-shaping circuits, oscillators, signal conditioners and various application based circuits using OP-AMP and Transistors
3. Study various concepts of analog communication
4. Study various concepts of digital communication.
5. develop an application based project using industry based OPAMP

#### Instructions:-

1. Minimum 9 practicals including miniproject (3 from Analog Electronics Section, 2 from Analog Communication category, 3 from digital communication category)
2. One mini project to be developed with simulation and hardware on a general purpose or etched PCB. Use OPAMPS popularly used in Industry such LM324, LM 2902, LM 358, MC3403. A communication based miniproject can also be developed.
3. Perform Simulation of all experiments using any open-source or licensed software.

#### List of Experiments:

##### Analog Electronics

1. To use OPAMP for switching on and off a 230 V AC bulb of min 20W by designing necessary circuit
2. To use OPAMP for speed control of a 5V DC motor
3. To use OPAMP as an amplifier for amplifying thermocouple voltage to proportionate 12V DC
4. To use OPAMP as a current to voltage converter for amplifying solar cell signal
5. To use OPAMP as a voltage to current converter for converting 0-10V Dc to 4-20 mA DC
6. To use OPAMP as a triangular wave generator of frequency 5kHz
7. Use of OPAMP as PWM wave generator for frequency 10kHz and varying duty ratio of 10% to 90 %
8. Use of OPAMP to generate switching pulses for a Power BJT with 15V DC

9. To use OPAMP as a digital latch with single switch and two switches and use it to for switching of a 230V/10 W LED bulb
10. To design load cell amplifier using concept of instrumentation amplifier and associated noise handling circuit
11. Design of an RTD amplifier and calibrate its gain with zero offset adjustment
12. To study and Design of a Voltage to frequency converter with linearity
13. To study and Design of a frequency to voltage converter with linearity
14. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
15. To design OP-AMP as Precision Half wave rectifier and plot the waveforms.
16. Design and verify Multivibrator circuits using IC 555 and generate switching pulses of 1kHz at different duty ratios for SMPS switching application
17. Design RC oscillator/ transistorized LC oscillator using OP-AMP and calculate its frequency.
18. Design first & second order low pass Butterworth filer with a cutoff frequency of 1kHz.
19. Design of series voltage regulators of 12V/5V DC with a current capacity of 500mA

### **Analog Communication for Mini Project**

1. To calculate modulation index by observation of AM wave
2. To study quantization .
3. To study sampling theorem
4. To study companding
5. To study DSBSC transmitter and receiver.
6. To study time division multiplexing
7. To study Frequency modulation and compute the modulation index
8. To study FM generation using MATLAB
9. To study AM generation using MATLAB.

### **Digital Communication for Mini Project**

1. To write SCILAB code for BASK modulation/demodulation.
2. To write SCILAB code for BFSK modulation/demodulation.
3. To write SCILAB code for BPSK modulation/demodulation.
4. To generate a Differential Binary Phase Shift Keying signal using PSK modulator and detect the message signal from DBPSK signal using PSK demodulator using SIMTEL.
5. To generate a Minimum Shift Keying signal and detect the message signal from MSK signal using SIMTEL.
6. Open Problem Statement 1: Prepare/Analyze any Digital Communication System /Any other system using XCOS.
7. To perform Lempel-Ziv encoding and decoding.
8. To perform convolution encoding and decoding.
9. To perform OFDM Transmission and Reception.
10. To perform CDMA-DSSS Transmission and Reception.

### **Some examples are of Mini projects are as follows**

1. A Variable Audio Frequency Oscillator Using Op-amp
2. Adjustable Ripple-Regulated Power Supply Using OPAMP
3. Automatic Fence Lighting with Alarm
4. Auto-cut for Manual Stabilizers using IC

5. Automatic Light Operated Switch Using LDR and OPAMP
6. Bass Booster Using Op-amp
7. Battery Voltage State Indicator using
8. DC Volt Polarity Indicator Using IC
9. DIY Headphone Amplifier
10. Dual Trace Generator Circuit
11. Electronic Room Thermometer Using Op-amp
12. Four Channel Audio Mixture
13. High/Low Voltage Cut-out Using Op-Amp
14. Laser Based Communication Link
15. Light Sensor Switch Circuit using LDR
16. Listening Bug Using op-amp
17. Microphone Amplifier Using Op-amp
18. Operational Amplifier Tester
19. Sound Operated Intruder Alarm with Flash
20. Sort Circuit Protected Regulated Power Supply Using
21. Steam Whistle Circuit using IC
22. Temperature Deviation Indicator Using
23. Thermal Touch Switch Using Op-amp
24. Tone Control for Guitar Amplifier Using
25. Voltage into Frequency Converter
26. Wind Sound Generator Using IC
27. Sound detector circuit using op-amp
28. Electronic Fuse using OP-amp

**B.E. FOURTH SEMESTER**  
**ANALOG SYSTEM DESIGN**

Subject Code: BEETC-404T/BEEN-404T/BEEC-404T      Credits 04  
Teaching Scheme Lectures (including activity based learning):3 Hours/ Week  
Examination Scheme T (U): 70 Marks, T (I): 30 Marks  
Tutorial: 1 Hour / Week  
Duration of University Exam. : 03 Hrs

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**Course Objectives:**

The objective of this course is to provide students with understanding of

1. To understand characteristics of various Analog Circuits.
2. To study and interpret the datasheet.
3. To design and analyze linear and nonlinear applications of Op-Amp.
4. To design DC regulated power supply.
5. To design RC & LC oscillators.
6. To design RC Filters and drivers.

**Course Outcomes:**

Upon completion of this course, students will demonstrate the ability to:

1. Understand and explain the basic concepts of OPAMP.
2. Demonstrate the working principle of various analog circuits.
3. Analyze analog circuits to evaluate various performance parameters.
4. Design Op-Amp based circuits.
5. Design DC Power Supply.
6. Design Oscillators, filters and drivers.

**Course Contents:**

**UNIT-I: INTRODUCTION TO OPERATIONAL AMPLIFIER(14Marks)**

Op-Amp Fundamentals: Block diagram of operational amplifier, Differential amplifiers using transistors. Op-Amp parameters, virtual ground concept, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting & non inverting configurations.

**UNIT-II: OP-AMP LINEAR APPLICATIONS(14 Marks)**

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators, current to voltage converters, voltage to current converters, Peak detector, Log and antilog amplifiers and analog multipliers.

**UNIT-III: OP-AMP NON LINEAR APPLICATIONS (14Marks)**

Comparators, Schmitt trigger, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable using Op-Amp, Sample/Hold circuits, 555 Timer and its applications, Phase lock loops.

## **UNIT-IV: DESIGN OF DC POWER SUPPLY(7 Marks)**

Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78xx and 79xx, protection circuits for regulators, Design of SMPS (Buck & Boost)

## **UNIT-VI: DESIGN OF SINUSOIDAL OSCILLATORS, FUNCTION GENERATOR and FILTERS (14 Marks)**

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley & Colpitts oscillator, Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of Butterworth Active Filters LPF, HPF, BPF, BRF etc,

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

1. All Experiments are from Virtual Labs
2. At least 1 experiment activity should be conducted from every unit.
3. Some additional simulation-based activities feasible to be executed in classrooms can be added by the course teachers
4. At least 10 activities to be conducted in every course in classroom
5. Course faculty is permitted to use any other open source or licensed platform in classroom.
6. Course faculty can add any other activity as per the feasibility in classroom-based teaching learning process.

### **Suggested List**

1. Log and antilog amplifiers
2. Voltage comparator
3. Wien bridge oscillator using operational amplifier
4. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA
5. Voltage to current converters
6. Function generator using operational amplifier (sine, triangular & square wave)
7. Astable and monostable multivibrator using IC 555
8. Study of basic properties of Operational Amplifier: Inverting and Non-Inverting Amplifiers
9. Study of Differentiator and Integrator using Operational Amplifier\*\*

10. Non linear circuits using OPAMPS
11. Active filters

**Web links:**

1. <http://vlabs.iitb.ac.in/vlabs-dev/labs/analog-electronics/experimentlist.html>
2. <http://vlabs.iitkgp.ernet.in/be/index.html#>
3. <https://ee-iitb.vlabs.ac.in/index.html>

**Text Books:**

1. David A. Bell, ‘Op-amp & Linear ICs’, Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, ‘Linear Integrated Circuits’, II edition, New Age, 2003.
3. Ramakant A. Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2003 / PHI. 2000.
4. N. C. Goyal and Khetan ‘A Monograph on Electronics Design Principles’, Khanna Publications
5. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, McGraw Hill.

**Reference Books:**

1. Linear Integrated Circuits Manual I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Regulated Power supply Handbook. Texas Instruments.
4. Electronics: BJT’s, FETS and Microcircuits – Anielo.
5. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

**B.E. FOURTH SEMESTER**  
**DATA STRUCTURE & ALGORITHMS**

Subject Code: BEETC-405T/BEEN-405T/BEEC-405T                              Credits:03

Teaching Scheme Lectures(including activity based learning): 3 Hours/ Week

Examination Scheme: T (U): 70 Marks, T (I): 30 Marks

Duration of University Exam. : 03 Hrs

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**Course Objectives:**

1. To make students understand efficient storage structures of data for an easy access.
2. To teach the difference between linear & non linear data structures and its respective benefits
3. To design and implement various data structures.
4. To develop application using data structures and algorithm and analysis.
5. To improve the problem solving efficiency.

**Course Outcomes:**

1. Student will be able to choose appropriate data structure based on the specified problem definition and analysis the algorithm.
2. Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
3. Students will be able to apply concepts learned in various domains like Operating Systems, DBMS etc.
4. Students will be able to use linear and non-linear data structures like stacks, queues, linked list, trees etc.

**Course Contents:**

**UNIT I: Data Structures (7Marks)**

Introduction to Data Structures, Need of Data Structure, Abstract Data type, Types of Data StructuresAlgorithms: Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations (Big O, Omega  $\Omega$ , Theta  $\theta$  ), Time-Space trade-off. Searching- Linear & Binary Search, Sorting- Bubble Sort, Insertion Sort, Selection Sort, Algorithm design strategies - Divide and Conquer strategy, Merge Sort, Quick Sort, complexity analysis of sorting methods.

**UNIT II: Abstract Data Types (ADTs) Arrays (8 Marks)**

Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays  
Stacks- Introduction, PUSH and POP operations on Stacks, Prefix, Infix & Postfix expressions- Conversion and Evaluation, Multiple Stacks.  
Queues- Introduction, Insertion & deletion in Queues, Circular Queues, Priority Queues.

**UNIT III: Linked List- Linked List as ADT (7Marks)**

Dynamic Memory Allocation Functions, Types of Linked Lists- (single, double, circular), Operations on Linked Lists- (create, insert, delete, reverse etc.), Applications of Linked List- Polynomial Representation (Addition/deletion/multiplication of two polynomials). Trees- Introduction, Implementation of Trees, Tree Traversals with an Application, Binary Trees, BST- Insertion & Deletion, Expression Trees, AVL Trees, Heap Trees.

#### **UNIT IV: Graphs (7 Marks)**

Graphs- Data Structures for Graphs, Graph Traversals Directed Graphs, Graph Storage Structures (Adjacency Matrix, Adjacency List) Weighted Graphs, Shortest Paths, and Minimum spanning Trees. Applications of DFS and BFS.

#### **HASING TECHNIQUES**

Symbol Tables: static tree tables, dynamic tree tables, hash tables, hash functions, Collision resolution, overflow handling, Applications

#### **UNIT V: ALGORITHMS (7Marks)**

Advanced algorithms based on the data structures. Shortest-Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge Costs, Acyclic Graphs, Network Flow Problems, Matrix Chain Multiplication, Longest Common Subsequence, Optimal Binary Search Tree, Backtracking strategy - 4 queens problem, Hamiltonian Path.

#### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

#### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

- 1) All Experiments are from Virtual Labs
- 2) At least 1 experiment activity should be conducted from every unit.
- 3) Some additional simulation based activities feasible to be executed in classrooms can be added by the course teachers
- 4) At least 10 activities to be conducted in every course in classroom
- 5) Course faculty is permitted to use any other open source or licensed platform in classroom.
- 6) Course faculty can add any other activity as per the feasibility in classroom based teaching learning process.

## **Suggested List:**

1. Number Systems
2. Expression Evaluation using Stacks
3. Sorting using Arrays
4. Polynomials via Linked Lists
5. Search Trees
6. Expression Trees
7. Graph Traversals
8. Shortest Paths in Graphs
9. Minimum Spanning Trees
10. Bubble Sort
11. Merge Sort
12. Heap Sort
13. Quick Sort
14. Depth First Search
15. Breadth First Search
16. Tree Traversal
17. Binary Search Trees
18. Stacks and Queues
19. Infix to Postfix
20. Unsorted Arrays
21. Hashtables
22. Linked lists
23. Polynomial Arithmetic using linked lists
24. Selection Sort
25. Radix Sort
26. Topological Sort
27. Minimum Spanning Trees
28. Path algorithms: Dijkstra's shortest path
29. 2-3 Tree
30. Red Black Tree
31. Tries and Suffix Trees
32. Substring search: KMP algorithm

## **Text books:**

1. Data Structures with C, Seymour Lipschutz, Schaums Outlines, Tata McGraw Hill Education.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
3. Data Structures using C and C++ by Y. Langsam, Pearson Education.
4. Data Structures using C by Tanenbaum, Pearson Education
5. Data structures and Algorithm Analysis in C, 2nd edition, M.A. Weiss, Pearson

## **Reference books:**

1. Data Structures and program design in C by Robert Kruse, Bruce Leung & Clovis Tondo.
2. Data Structures: A Pseudocode Approach with C by Richard F. Gilberg and BehrouzForouzan.
3. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.

4. Introduction to Algorithms, by Thomas Cormen III edition, PHI
5. Analysis and Design of Algorithms: A Beginner's Approach, by Rajesh K. Shukla, Willey Publications
6. "Algorithms, Data Structuresand Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.

## B.E. FOURTH SEMESTER

# Programming for Problem Solving

Subject Code: BEETC-407T/BEEN-407T/BEEC-407T

Credits 02

Teaching Scheme Lectures(including activity based learning): 2 Hours/ Week

Examination Scheme: T (U): 35 Marks, T (I): 15 Marks

Duration of University Exam. : 02Hrs

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### Course Objectives

1. To understand the basic concepts of Object Oriented Programming.
2. To implement the concepts of Inheritance in Problem solving.
3. To apply the concepts of Polymorphism and Interfaces.
4. To implement the concepts of Exception Handling
5. To design and implement program using file system.

### Course Outcomes

1. Student will be able to understand the basic concepts of Object Oriented Programming and design simple java programs.
2. Student will be able to apply the knowledge of Inheritance in program development.
3. Student will be able to develop programs using polymorphism and interfaces.
4. Student will be able to handle various exceptions using concepts of exception handling.
5. Student will be able to use multithreading concepts to develop inter process communication.
6. Student will be able to understand and implement concepts on file streams and operations in java programming for a given application programs.

### Course Contents

#### **Unit-1 Introduction (4Hrs)**

Introduction: Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue, Methods.

#### **Unit 2: Classes and Objects (5Marks)**

Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.

#### **Unit 3: Inheritance and Polymorphism (5Marks)**

Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding, Handle multilevel constructors – super keyword, Stop Inheritance - Final keywords.

Polymorphism: dynamic binding, method overriding, abstract classes and methods;

## **Unit-4: Interfaces and Packages (5Marks)**

Interface: Interfaces vs. Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface.

Packages: Defining, creating and accessing a package, understanding Class path, importing packages.

## **Unit-5: Exception Handling and I/O Streams (5 Marks)**

Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re-throwing exceptions, GUI components in Java, Introduction to Database Connectivity.

**I/O Streams:** Concepts of I/O streams, Reading console Input and Writing Console output, File Handling.

### **Continuous Assessment (Internal Marks) evaluation guidelines:**

1. A total mark allotted for internal marks is 30. Out of this, 10 marks shall be exclusively allotted to activity-based learning.
2. Remaining 20 marks can be based on continuous tests/ examinations, assignments etc. as per internal mark policy of the institute.

### **Activity Based Learning**

#### **Instructions for Activity Based Learning**

- 1) All Experiments are from Virtual Labs
- 2) At least 1 experiment activity should be conducted from every unit.
- 3) Some additional simulation based activities feasible to be executed in classrooms can be added by the course teachers
- 4) At least 10 activities to be conducted in every course in classroom
- 5) Course faculty is permitted to use any other open source or licensed platform in classroom.
- 6) Course faculty can add any other activity as per the feasibility in classroom based teaching learning process.

#### **Suggested List:**

1. Accessing Instance and Variables
2. Parameterized Constructors
3. Reference Datatypes
4. Static variables
5. Enhanced Loop in Java
6. Concatenating Strings

7. String Methods
8. foreach loop
9. Call by value
10. Method Overloading
11. Command Line Arguments
12. Reading and Writing Files
13. Directories in Java
14. Exception Hierarchy
15. Multiple Catch Blocks
16. Finally Block
17. extends keyword
18. super keyword
19. Abstract class and methods
20. Implementing and Extending Interfaces
21. import keyword
22. Creating Packages

**Text books:**

1. Herbert Scheldt, “Java the complete reference”, McGraw Hill, Osborne, 7th Edition, 2011.

**Reference Books:**

2. T. Budd, “Understanding Object- Oriented Programming with Java”, Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

## B.E. FOURTH SEMESTER

### Programming and Data Structure Lab

Subject Code: BEETC-407P/BEEN-407P/BEEC-407P

Credits 02

Teaching Scheme Lectures: 4 Hours/ Week

Examination Scheme T (U): 25 Marks, T (I): 25 Marks

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#### Course Objectives:

*The course objectives are:*

1. To understand the basic concepts of Object Oriented Programming.
2. To implement the concepts of Inheritance in Problem solving.
3. To apply the concepts of Polymorphism and Interfaces.
4. To implement the concepts of Exception Handling
5. To design and implement various data structures.
6. To develop application using data structures and algorithm and analysis.

#### Course Outcomes:

*After the completion of practicals, the students will be*

1. Able to choose appropriate data structure based on the specified problemdefinition and analysis the algorithm.
2. Able to handle operations like searching, insertion, deletionand traversingmechanism etc. on various data structures.
3. Apply the knowledge of Inheritance in program development.
4. Develop programs using polymorphism and interfaces.
5. Handle various exceptions using concepts of exception handling.

#### List of Experiments:

- 1,2. Practicals based on Introduction to Problem Solving
3. Practicals based on classes and objects
4. Practicals based on Inheritance
- 5,6. Practicals based on Polymorphism
7. Practicals based on Exception Handling
- 8,9. Practicals based on IO streams and File handling.
10. Practicals based on Stacks & Queues using Arrays
11. Practicals based on Linked Lists
12. Practicals based on Stacks & Queues using Linked Lists
13. Practicals based on Binary Search Trees
14. Practicals based on Graphs
15. Practicals based on Spanning trees

**B. E. Fifth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg.)**  
**Antenna & Wave Propagation**

**Duration: 3 Hrs.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

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**Subject Code: BEECE501T/BEETE501T** **[4 – 0 – 1 – 5]**

**Objectives:**

1. To study transmission line characteristics.
  2. To study the basics of radiating elements and effect of propagation of radio waves in actual environment.
  3. To study the antennas, their principle of operation, analysis and their applications.
  4. To study the features of Antenna array, Microstrip antenna and reflector antenna.
  5. To study designing aspects of Antenna.
- 

**Outcome:**

At the end of the course the students shall be able to:

1. Describe transmission line characteristics.
  2. calculate antenna parameters (radiation pattern, beam width, lobes, directivity, gain, impedance, efficiency, polarization)
  3. Analyze wire antennas (monopoles, dipoles, and loops).
  4. Analyze and design antenna arrays.
  5. Describe the operation of broadband and traveling wave antennas.
  6. Describe the operation of aperture and reflector antennas.
  7. Analyze and design Microstrip antennas.
- 

**Unit I: Transmission Lines** **(12)**

Transmission line equations and their solution , transmission line parameters, characteristics impedance, propagation constant, attenuation constant and phase constant, waveform distortion , distortionless transmission lines, loading of transmission lines, reflection coefficient and VSWR, Equivalent circuits of transmission lines, transmission lines at radio frequency, open and short circuited lines,smith chart, stub matching.

**Unit II: Linear wire antennas** **(12)**

Infinitesimal dipole, its radiation field, radiation resistance, radiation sphere, near field, far field directivity, small dipole, finite length dipole, half wave length dipole, linear elements near or on infinite perfect conductors, ground effects and their application, folded dipole

**Loop Antenna:**

Small loop, comparisons of small loop with magnetic dipole, radiation pattern its parameters and their application

**Unit III: Arrays****(10)**

Linear arrays, planer arrays and circular arrays. Array of two isotropic point sources, non – isotropic sources, principle of pattern multiplication, linear arrays of n elements, broadside, End fire, radiation

Pattern, directivity, Beam width and null directions, array factor, Antenna analysis using Dolph-Tschebyscheff, the Log-periodic antenna, the composite Yagi-Uda-Corner-Log-Periodic array

**Unit IV: Microstrip antennas****(08)**

Radiation Mechanism of Microstrip antenna, feeding methods, methods of analysis, Multiband Microstrip antenna for Mobile Communication, Circularly Polarized Patch antenna, Rectangular & circular patch, Circular polarization and feed network.

**Unit V: Reflector antennas****(06)**

Simple reflectors, the design of a shaped Cylindrical reflector, Radiation patterns of Reflector Antennas, Dual shaped Reflector Systems Plane reflector, Corner reflector, horn antenna, aperture antenna.

**Unit VI: Antenna Measurements****(12)**

Reciprocity in antenna Measurements, Near-Field & Far-Field, Co-ordinate System, Sources of Error in antenna measurements, measurement ranges, measurement of different antenna Parameters, antenna ranges, radiation pattern, Gain and directivity, Polarization

Radio Wave Propagation: Atmosphere of Earth, Terrestrial Propagation of Electromagnetic waves, Fading, Noise and interference, Ground wave propagation, Ionospheric propagation

**Books:****Text Books:**

1. Antenna Theory analysis and design – Costantine A. Balanis, John Wiley publication
2. Antenna and Wave propagation, - K.D. Prasad, Satya Prakashan
3. Electromagnetic – Jordan Balmann, Prentice Hall of India publication
4. Antenna Theory and Design , Robert S. Elliott , Wiley Student Edition
5. Electromagnetic Waves- R. K. Shevgaonkar

**Reference Books:**

1. Antenna & Wave Propagation , Sisir K Das, Mc Graw Hill
2. Harish A. R., Antenna and wave Propagation, Oxford University Press
3. Antennas and Radio Propagation, R.E. Collins, Mc Graw -Hill

## B. E. Fifth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

### MICROPROCESSOR AND MICROCONTROLLERS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

**Subject Code: BEENE502T/ BEECE502T/ BEETE502T**

**[4 – 0 – 1 – 5]**

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#### **Objectives:**

The course objectives are:

1. To study fundamentals of microprocessor and microcontroller systems.
  2. To study architecture of microprocessor & to understand the concept of memory organization, stack memory, Assembly language programming.
  3. To study different interrupt techniques.
  4. To study interfacing of microprocessor & microcontroller with different peripheral devices.
- 

#### **Outcome:**

After completing this course students shall be able to:

1. Describe internal organization of 8086/8088 microprocessors & 8051microcontrollers.
  2. Describe the concept of addressing modes and timing diagram of Microprocessor.
  3. Interface 8086 & 8051 with Keyboard/ Display, ADC/DAC, Stepper motor etc.
  4. Demonstrate the concept of interrupts and its use.
  5. Demonstrate the concept of Serial & parallel data communication
  6. Describe Handshaking concept and interfacing with peripheral devices.
  7. Describe the concept of DMA & Pentium.
  8. Describe 8087 Numeric coprocessor & its use in practical application.
  9. Interface various hardware with microprocessor.
- 

#### **Unit I: Intel 8086/8088 microprocessor & Programming:**

**(09)**

8086/8088 microprocessor, Pin diagram, Architecture, features and operating modes, Clock generator 8284, memory organization & interfacing, Addressing modes, complete instruction set.

#### **Unit II: 8086 & Peripheral Interfacing I:**

**(11)**

Assembly language programming of 8086, Interrupt structure, I/O interfacing, Interfacing of peripherals like 8255 PPI, multiplexed 7-seg display & matrix keyboard interface using 8255. Programmable Keyboard/Display controller 8279, Organization, Working modes, command words & interfacing.

#### **Unit III: 8086 & Peripheral Interfacing II:**

**(10)**

Programmable interval timer/counter 8254;      Architecture, working modes, interfacing 8259 PIC,

Organization, control words, interfacing, cascading of 8259's. Serial communication, Classification & transmission formats. USART 8251, Pins & block diagram, interfacing with 8086 & programming.

**Unit – IV: Numeric Co-processor & DMA Controller:****(10)**

8086 maximum mode pin diagram, Closely coupled & loosely coupled multiprocessor system, 8087 Numeric coprocessor, architecture, interfacing with 8086, instruction set.DMAC 8237, Architecture, interfacing & programming, Introduction to Pentium.

**Unit – V: 8051 microcontroller & programming:****(10)**

Introduction to 8051 microcontroller; Pin diagram, architecture, features & operation, Ports, memory organization, SFR's, Flags, Counters/Timers, Serial ports. Interfacing of external RAM & ROM with 8051. 8051 Interrupt structure, Interrupt vector table with priorities, enabling & disabling of interrupts

**Unit – VI: 8051 microcontroller interfacing:****(10)**

Instruction set of 8051; data transfer, logical, arithmetic & branching instructions, Addressing modes, Assembly language programming examples, counter/timer programming in various modes. Serial communication, Operating modes, serial port control register, Baud rates. I/O expansion using 8255, Interfacing keyboard, LED display, ADC & DAC interface, stepper motor interface

**Books:****Text Books:**

1. Programming & Interfacing of 8086/8088, D.V. Hall, TMH.
2. Microprocessor 8086/8088 Family Programme Interfacing: Liu & Gibson
3. M.A. Mazidi & J.G. Mazidi, the 8051 Microcontroller and Embedded system, 3<sup>rd</sup> Indian reprint, Pearson Education
4. The Intel Microprocessor 8086 & 80486 Pentium and Pentium Pro. Architecture Programming and Interfacing – Brey.

**Reference Books:**

1. Intel Reference Manuals, Microprocessors & Microcontrollers: Intel
2. Microcontrollers – Peatman, Mc Graw Hill.
3. Microprocessors & Microcomputers based system design by Md. Rafiquzzaman.
4. 8086/8088 Microprocessors, Walter Triebel & Avtar Singh
5. Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh, P. R. Sridhar, PHI Publication.
6. The 8051 Microcontroller & Embedded Systems, Kenneth J. Ayala, Dhanvijay V. Gadre, CENGAGE Learning.

**B. E. Fifth Semester**

**(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)**

**MICROPROCESSOR AND MICROCONTROLLERS**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25 Marks**

**Subject Code: BEENE502P/ BEECE502P/ BEETE502P**

**[0 – 2 – 0 – 2]**

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**Objectives:**

1. To perform a practical based on microprocessor and microcontroller based system.
  2. To study assembly language programming skills.
  3. Interface different peripherals with microprocessor and microcontroller with its use.
- 

**Outcome:**

At the end of the course the students shall be able to:

1. Demonstrate the concept of Assembly languages structure and programming.
  2. Interface various peripherals with 8086 and 8051.
  3. Simulate the programs on different software platforms.
- 

**Any TEN practicals are to be conducted.**

**List of Experiments:**

1. Study of 8086 microprocessor.
2. Write and execute 8086 assembly Language Programs to multiply two 16 bit numbers.
3. Write and execute 8086 assembly Language Programs to divide 16 bit number by 8 bit number.
4. Write and execute 8086 assembly Language Programs to search a look-up table for a byte (make use of XLAT)
5. Write and execute 8086 assembly Language Programs to compare two strings (use String instructions)
6. Write and execute 8086 assembly Language Programs to arrange the data bytes in ascending/descending order.
7. Write and execute 8086 assembly Language Programs to generate Fibonacci series and store it from memory location 0050H.
8. Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
9. Write and execute 8051 assembly language program to exchange two data strings.
10. Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port.
11. Interface 8255 with 8086 microprocessor and write a program to glow the alternate LED's.
12. Interface 8255 with 8086 microprocessor and write a program to rotate the stepper motor.

13. Interface 8253 with 8086 microprocessor and write a program to generate square waveform.
14. Interface 8279 with 8086 microprocessor and write a 8086 instructions to initialize 8279 (for a task as per the user's requirement).
15. Interface of ADC using 8255 with 8086 and write a program to convert analog signal input into its equivalent digital value and store it in memory locations.

**Note:** Few programs should be based on MASM / Simulator. Minimum 4 interfacing experiments should be conducted.

**B. E. Fifth Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**ANALOG CIRCUIT AND DESIGN**

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEENE503T/ BEECE503T/BETTE503T**

**[4 – 0 – 1 – 5]**

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**Objectives:**

The course objectives are:

1. To study the basic characteristic, construction, open loop & close loop operations of Op-Amp.
  2. To study linear and non linear applications of Op-Amp.
  3. To study the design of Electronic Circuits for Oscillator, Multivibrator and Active Filters
  4. To enable students to design regulated power supply using regulated ICs
- 

**Outcome:**

After completing this course students shall be able to:

1. Describe the basic differential Amplifier using transistor and its operation & characteristic.
  2. Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
  3. Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
  4. Analyze and design amplifier circuits, oscillators, Filter, regulated power supply
- 

**Unit I: OP-Amp Fundamentals:**

**(8)**

Block diagram of OP-Amp (Basic Building Blocks), Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit, Voltage Transfer curve, Inverting and Non-inverting configurations and design, concepts of virtual short and ground.

**Unit II: OP-Amp Linear Applications:**

**(10)**

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), Peak detector, Log and antilog amplifiers using OP-Amp & Transistor and analog multipliers.

**Unit III: OP-Amp Non-Linear Applications:**

**(12)**

Comparators, Schmitt trigger, Comparator IC such as LM 339, Clipper and Clamper, Precision Rectifier, PLL  
Multivibrators: Bistable, Monostable, Astable multivibrator circuits using IC 555, Sample/Hold circuits,  
D/A (R/R) & A/D conversion circuits (Successive Approximation Method), design of ADC using 0804 ICs.

**Unit IV: Design of Power supply system:** (09)

Unregulated D.C. power supply system with rectifiers and filters, Design of series voltage regulators, Design of regulators using IC 78xx and 79xx, protection circuits for regulators, Design of SMPS (Buck & Boost)

**Unit V: Design of sinusoidal oscillators & Function generator:** (09)

OPAMP based Wein Bridge and Phase Shift oscillators, Transistorized Hartley, Colpitts oscillator, and Crystal oscillators, Evaluation of figure of merit for all above oscillator circuits. Design of function generators.

**Unit VI: Design of Filters & Drivers:** (12)

Advantages of active filters, Design of Butterworth Active Filter, Design of Active filter of LPF, HPF, BPF  
of 1<sup>st</sup> order, 2<sup>nd</sup> and higher order (up to 6<sup>th</sup> order) Butterworth filter.

Design of Relay driver circuit, Design of stepper motor control circuit, Design of Dc servo motor control circuit

**Books:**

**Text Books:**

1. Operational Amplifier and Applications: R. Gayakwad.
2. Monograph on Electronic circuit Design: Goyal & Khetan.
3. Franco: Designing with Op-Amps (McGraw Hill).

**Reference Books:**

1. Linear Integrated Circuits Mannal I, II, and III: National Semiconductor.
2. Linear Applications Handbook National Semiconductors.
3. Dailey: Operational Amplifier (Tata McGraw Hill).
4. Regulated Power supply Handbook. Texas Instruments.
5. Electronics: BJT's, FETS and Microcircuits – Anielo.
6. Operational Amplifier Design and Applications Tobey, Graham, Huelsman McGraw Hill.

**B. E. Fifth Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**ANALOG CIRCUIT AND DESIGN**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25Marks**

**Subject Code: BEENE503P/ BEECE503P/BEETE503P**

**[0 – 2 – 0– 2]**

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**Objectives:**

1. To learn about various types of analog systems.
  2. To study the practical aspects of linear and non-linear applications of OP-AMP.
  3. To design the oscillators using OP-AMP and Transistors.
  4. To study frequency response of different circuits based on operational amplifier.
- 

**Outcome:**

At the end of the course the students shall be able to:

1. Gain a sound understanding of the operation, analysis and design of analog electronic circuits and systems
  2. Design linear and nonlinear applications of operational amplifier.
  3. Design the oscillators and other complex circuits using op amp ICs.
  4. Demonstrate the gain-bandwidth concept and frequency response of basic amplifiers.
- 

**Any TEN practicals are to be conducted**

**LIST OF EXPERIMENTS**

1. (A)Design Non-Inverting OP-AMP and measure the gain and plot the input/output waveforms.  
(B)Design Inverting OP-AMP and measure the gain and plot the input/output waveforms.
2. Plot the Frequency response of Inverting and Non-inverting amplifiers.
3. Implementation of Op-Amp as adder & subtractor.
4. To design OP-AMP as Integrator and Differentiator and plot its input/output waveforms.
5. To design OP-AMP as Schmitt trigger for generating a waveform of specific pulse width.
6. To design OP-AMP as peak detector.
7. To design OP-AMP as Precision rectifier and plot the waveforms.
8. To Verify Op-amp parameters (1) CMRR (2) Slew Rate.
9. To Verify and simulate Clipper circuit using IC 741.
10. Design and verify Multivibrator circuits using IC 555.

11. To study Phase Lock Loop using IC 565.
12. To study OP-AMP as Clippers & Clampers.
13. Design RC oscillator using OP-AMP and calculate its frequency.
14. Design transistorized LC oscillator and calculate its frequency.
15. Design first & second order low pass Butterworth filer.
16. Design first & second order high pass Butterworth filer.
17. Design of series voltage regulators.
18. Design of Driver Circuit for DC servomotor/Relays.
19. Design of control circuit for stepper motor.

**Note:** Simulate results using simulation software for at least four experiments.

## B. E. Fifth Semester

(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)

### COMMUNICATION ELECTRONICS

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

**Subject Code: BEENE504T/ BEECE504T/BETTE504T**

**[4 – 0 – 1 – 5]**

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#### Objectives:

The course objectives are:

1. To study the basic concept of communication and different modulation system based on basic parameters.
  2. To study the concept of noise, properties & its effects.
  3. To study the AM, FM, PM process & compute modulation Index.
  4. To study the fundamentals of AM and FM Receivers.
  5. To develop knowledge about fundamentals of Broadband Communication Systems.
- 

#### Outcome:

At the end of the course the students shall be able to:

1. Demonstrate a basic understanding of the term bandwidth and its application in communications.
  2. Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and angle modulation and demodulation of analog signals etc.
  3. Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
  4. Compare different modulation techniques of Generation of FM (Direct & Indirect Method)
  5. Identify, formulate & solve communication engineering problems.
- 

#### Unit I: Amplitude (Linear) Modulation

**(08)**

Base band & Carrier communication, Introduction of amplitude modulation, Equation of AM, Generation of AM (DSBFC) and its spectrum, Modulation Index , Power relations applied to sinusoidal signals, DSBSC – multiplier modulator, Non linear generation, switching modulator, Ring modulator & its spectrum, SSBSC, ISB & VSB, their generation methods & Comparison, AM Broadcast technical standards.

#### Unit II: Angle Modulation

**(12)**

Concept of Angle modulation, Types of Angle Modulation, frequency spectrum, Narrow band & wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), Comparison of FM and PM.

#### Unit III: Pulse Modulation

**(10)**

Band limited & time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect.

Pulse Analog modulation: PAM PWM & PPM.

**PCM** – Generation & reconstruction, Bandwidth requirement of PCM.Differential PCM, Delta Modulation & Adaptive DM. (Only Block diagram treatment).

**Unit IV: Noise****(10)**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem Connection, Noise Figure, Noise Temperature, Friis formula for Noise Figure, Noise Bandwidth.

**Unit V: AM and FM Receivers****(10)****Communication Receiver, Block Diagram & special Features**

Block diagram of AM and FM Receivers, Super heterodyne Receiver, Performance characteristics:  
Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Pre-emphasis, De-emphasis

**AM Detection:** Rectifier detection, Envelope detection, Demodulation of DSBSC: Synchronous detection, Demodulation of SSBSC.

**FM Detection:** Foster Seelay FM Detector & FM detection using PLL

**Unit VI: Broadband Communication Links & Multiplexing:****(10)**

**Multiplexing:** Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

**Short and Medium Haul Systems:** Coaxial Cables, Fiber optic links, Microwave Links, Tropospheric scatter Links.

**Long Haul Systems:** Submarine cables.

**Books:****Text Books:**

1. Kennedy & Devis : Electronic Communication Systems , Tata McGraw Hills Publication(Fourth Edition)
2. Dennis Roddy & Coolen - Electronic Communication, PHI (Fourth Edition)
3. B. P. Lathi: Modern Digital and Analog. Communication Systems: Oxford Press Publication (Third Edition)

**Reference Books:**

1. Simon Haykin: Communication Systems, John Wiley & Sons (Fourth Edition)
2. Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
3. Leon W.Couch, II: Digital and Analog Communication Systems, Pearson Education (Seventh Edition)
4. Electronic Communication Systems, Roy Blake, CENGAGE Learning.

**B. E. Fifth Semester**

**(Electronics / Electronics & Communication / Electronics & Telecommunication Engg)**

**COMMUNICATION ELECTRONICS**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25 Marks**

**Subject Code: BEENE504P/ BEECE504P/BEETE504P**

**[0 – 2 – 0 – 2]**

**Objectives:**

1. To perform practical based on analog and digital modulation techniques.
2. To study the analysis of AM and FM receivers.
3. To study ASK, FSK and PSK techniques.
4. To perform Matlab based practical for different modulation techniques.

---

**Outcome:**

At the end of the course the students shall be able to:

1. Demonstrate different modulation techniques used in electronic communication system.
2. Use the modulation techniques and modern communication tools necessary for various engineering applications.
3. Evaluate fundamental communication system parameters, such as bandwidth power, signal to quantization noise ratio, data rate etc.

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**Any TEN practicals are to be conducted**

**List of Experiments:**

1. To generate Amplitude Modulated wave using different techniques and plot its waveform.
2. To study different AM detection techniques.
3. To measure Noise Figure.
4. To generate Frequency Modulated wave using different techniques and plot its waveform.
5. To study different FM Detection Techniques.
6. To generate Pulse Amplitude Modulation (PAM) and plot the waveforms. Observe the demodulated output.
7. To generate Pulse Width modulated signal and study PWM demodulation.
8. To generate Pulse Position modulated signal and study Pulse Position Demodulation.
9. To study Single side band (SSB) Transmission & Reception
10. To study Double Side Band (DSB) Transmission & Reception
11. To study generation of SSB-SC using balanced modulator
12. To study generation of DSB-SC signal.
13. To study DTMF Encoder Decoder

14. To perform Spectrum Analysis of AM & FM signals
15. To perform Time Division Multiplexing (TDM).
16. To study Pre-Emphasis and De-Emphasis
17. To study Super heterodyne Receiver
18. To study FM radio receiver circuit.
19. Simulation of Analog modulation techniques using MATLAB.
20. Simulation of Frequency modulation techniques using MATLAB.
21. To perform Pulse Code Modulation (PCM) using Simulation in MATLAB.

**B. E. Sixth Semester**

**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**TELECOMMUNICATION SWITCHING SYSTEMS**

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE601T/ BEETE601T**

**[4 – 0 – 1 – 5]**

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**Objectives:**

The course objectives are:

1. To study the latest development of Telecommunication systems.
  2. To study the architecture and major design issues related to switching systems.
- 

**Outcome:**

After completing this course students shall be able to:

1. Describe the need for switching systems and their evolution from analogue to digital.
  2. Describe the Public Switched Telephone Network.
  3. Describe private networks.
  4. Describe integrated networks.
- 

**Unit 1: Telecommunication Switching Systems**

**(10)**

Principles of manual switching system, electronic telephone, local and central battery system, trunk exchange, junction working. Automatic telephony: stronger exchange, line switches and selectors, ringing and tone circuit, subscriber uniselector circuit, trunking diagram, cross bar switching system

Message switching, Circuit switching, manual switching and Electronic Switching. Digital switching: Switching functions, space division switching, time division switching, two dimensional switching, digital cross connect systems, digital switching in an analog environment.

**Unit 2: Telecommunication Traffic**

**(10)**

Unit of Traffic, Traffic measurement, a mathematical model, Lost-call systems: Theory, traffic performance, loss systems in tandem. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, systems with a single server, Queues in tandem, delay tables and application of Delay formulae. Analysis: Traffic Characteristics: Arrival Distributions, Holding time Distribution. Loss Systems: Lost calls cleared, lost calls returning, lost calls Held, lost calls cleared.

**Unit 3: Switching Networks****(12)**

Single Stage Networks, Gradings: Principle, Design of progressive grading, other gradings, Traffic capacity of gradings, Applications of gradings. Link Systems: General, Two stage networks, three stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, Call packing, Rearrangeable networks, Strict sense non blocking networks, Sectionalized switching networks Control of Switching Systems: Call processing Functions: Sequence of operations, Signal exchanges, State transition diagrams. Common Control, Reliability, Availability and Security.

**Unit 4: Network Synchronization and Management****(08)**

Timing: Timing Recovery, Clock Instability, Elastic Stores, Jitter measurements, systematic jitter. Timing Inaccuracy: Slips, Asynchronous Multiplexing, Waiting time jitter. Network Synchronization: Plesiochronous, pulse stuffing, mutual synchronization, Network master, Master – Slave synchronization, Hierarchical synchronization Processes. Network management: Routing control, Flow control.

**Unit 5: Networks****(10)**

Data Networks: Data Transmission in PSTN, Data Communication Architecture, Link to link layers, End to End layers, Satellite based Data networks, LANs, MANs, Fiber optic networks, Data network Standards, Protocol stacks, Interworking. Integrated Services Digital Networks: ISDN, Network and protocol Architecture, Transmission Channels, User network interfaces, signaling, Numbering and Addressing, ISDN Standards, Broadband ISDN, Voice Data Integration

**Unit 6: Cellular Telephone Concepts****(10)**

Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular System topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone calls processing. Cellular Telephone systems: Digital cellular telephone

**Books:****Textbooks:**

1. J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education
2. John C. Bellamy, "Digital Telephony", Third Edition; Wiley Publications
3. Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications
4. Wayne Tomasi, "Electronic Communications Systems"; 5th Edition; Pearson Education

**Reference Books:**

1. P.Gnanasivam,"Telecommunication Switching and Networks.
2. Rappaport,"Wireless communication"
3. Tannenbaum"Data communication and networks" 4<sup>th</sup> Edition,TMH

## B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

### DIGITAL SIGNAL PROCESSING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

**Subject Code: BEENE602T/ BEECE602T/ BEETE602T**

**[4 – 0 – 1 – 5]**

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#### **Objectives:**

1. To study the basic concepts of digital signal processing.
  2. To study analysis and processing of signals for different kind of applications and retrieval of information from signals.
  3. To understand the physical significance of circular convolution and its relation with linear convolution.
  4. To study designing of digital filters and its realization.
  5. To study analysis of signals using the discrete Fourier transform (DFT) and Z-Transform.
  6. To study behavior of discrete time systems using Z-Transform.
- 

#### **Outcome:**

By the end of the course the students shall be able to:

1. Represent discrete-time signals analytically and visualize them in the time domain.
  2. Meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
  3. Design and implement digital filter for various applications.
  4. Describe the various transforms for analysis of signals and systems.
  5. Describe the concept of multi rate signal processing and how to apply it for the wavelet transform.
- 

#### **Unit I: Introduction**

**(08)**

Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data.

Discrete time signals & systems: Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

#### **Unit II: Z-Transforms**

**(08)**

The Z-transform: Definition, properties of the region of convergence for the Z-transform, Z-transform properties, Inverse Z-transform, Parseval's theorem, unilateral Z-transform.

**Unit III: Discrete and Fast Fourier Transforms****(12)**

Definition and properties of DFT, IDFT, Relation between DFT and Z-Transform, Radix- 2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

**Unit IV: IIR Filter Design & Realization****(12)**

Filter design methods – Approximation of derivatives, Impulse invariance, bilinear transformation, characteristics & designing of Butterworth, Chebyshev filters, frequency transformations, IIR filter structures- Direct form I-II, transpose form, parallel form, cascade, Lattice and Lattice-ladder structures.

**Unit V: FIR Filter Design & Realization****(12)**

Symmetric and antisymmetric FIR filters, Linear phase FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hanning, Hamming & Blakman), frequency sampling method, FIR differentiators, FIR filter structures.

**Unit VI: Multirate DSP****(08)**

Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by rational factor I/D, Sub band coding of speech signals and its applications, introduction to wavelet & wavelet transform, Introduction to DSP architecture TMS 320.

**Books:****Text Books:**

1. J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.
2. A.V. Oppenheim, R.W. Schafer, "Discrete Time Signal Processing", Pearson Education.
3. Rabiner Gold " Theory and Application of DSP", PHI
4. Texas Instruments and Analog Devices DSP Chip Manuals.

**Reference books:**

1. Digital signal processing- A practical approach Second Edition, 2002. E. C. Ifeachar, B. W. Jarvis Pearson Education
2. Sanjit K. Mitra , 'Digital Signal Processing – A Computer based approach'
3. S. salivahanan, A Vallavaraj, C. Gnanapriya , 'Digital Signal Processing', 2nd Edition McGraw Hill.
4. A. Nagoor Kani, 'Digital Signal Processing', 2nd Edition McGraw Hill.
5. P. Ramesh Babu, 'Digital Signal Processing' Scitech

**B. E. Sixth Semester**

**(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)**

**DIGITAL SIGNAL PROCESSING**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25 Marks**

**Subject Code: BEENE602P/ BEECE602P/ BEETE602P**

**[0 – 2 – 0 – 2]**

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**Objectives:**

1. To understand principle & working of digital signal processing for various applications.
  2. To understand Z transforms and discrete time Fourier transforms for the analysis of digital signals and systems.
  3. To design and implement FIR & IIR filter and analysis of their frequency response.
- 

**Outcome:**

At the end of the course the students shall be able to:

1. Analyze and process the signals in the discrete domain.
  2. Design the filters to suit requirements of specific applications.
  3. Apply the techniques, skills, and modern engineering tools like MATLAB and digital processors.
- 

**Any TEN practicals are to be conducted**

**LIST OF EXPERIMENTS**

1. To plot and represent following basic discrete time signals using MATLAB functions. :  
Unit impulse, unit step, ramp, real and complex exponential and its representations
2. To plot linear convolution of discrete signals using MATLAB functions.
3. Write a program to compute cross-correlation and auto-correlation of the given sequences with corresponding plot.
4. Write a program to test stability of given discrete- time system.
5. To find Z transform of discrete time signal and its ROC with corresponding plot.
6. To find inverse Z transform of given discrete time signal.
7. Write a program to find frequency response of given system.
8. To compute DFT and IDFT of discrete time signals.

9. Write a program to find FFT and IFFT of given sequences.
10. Compute linear and circular convolution using DFT / IDFT method
11. Designing of Digital IIR filter using MATLAB functions.
12. Designing of Digital FIR filter using window.
13. Designing of Digital FIR filter using GUI tool box.
14. To Study DSP Processor using TMS 5416 and TMS 6713 starter kits.
15. To perform linear convolution and circular convolution on Processor kit.
16. To designning and implementation of High pass filter on DSP processor.

## B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

### CONTROL SYSTEM ENGINEERING

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

**Subject Code: BEENE603T/ BEECE603T/ BEETE603T**

**[4 – 0 – 1 – 5]**

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#### **Objectives:**

The Course Objectives are:

1. To study the fundamental concepts of Control systems and mathematical modeling of the system.
  2. To study the concept of time response and frequency response of the system.
  3. To study controllers & compensators.
  4. To study the basics of stability analysis of the system.
- 

#### **Outcome:**

At the end of the course the students shall be able to:

1. Analyze various control systems.
  2. Represent the mathematical model of a system.
  3. Determine the response of different order systems for various step inputs.
  4. Analyze the stability of the system using Root locus, Bode plot, Nyquist plot.
  5. Obtain transfer function of systems using signal flow graph.
  6. Apply the state variable approach in design.
- 

#### **Unit I: Introduction and Modeling of control system**

**(11)**

Introduction to need for automation and automatic control, use of feedback, Broad spectrum of system application. Mathematical modeling, Differential equations, transfer functions, block diagram, signal flow graphs, Effect of feedback on parameter variation, disturbance signal, servomechanisms. Control system components, Electrical, Electromechanical. Their functional analysis and input, output representation.

#### **UNIT-II: Time Domain analysis**

**(09)**

Time response of the system, first order & second order system, (standard inputs) concept of gain & time constant, steady state error, type of control system, approximate method for higher order system. Principles of P,PI,PD,PID controllers.

#### **UNIT-III: Stability & Root Locus method**

**(11)**

Stability: Stability of control systems, conditions of stability, characteristic equation, Routh Hurwitz criterion, special cases for determining relative stability.

Root Locus method: Root location and its effect on time response, elementary idea of Root Locus, effect of adding pole and zero and proximity of imaginary axis.

**UNIT-IV: Frequency response analysis****(11)**

Frequency response method of analysing linear system, Nyquist & Bode Plot, stability & accuracy analysis from frequency response, open loop & closed loop frequency response.

Nyquist criteria, effect of variation of gain & addition of poles & zeros on response plot, stability margin in frequency response.

**UNIT-V: Compensators****(08)**

Needs of compensations, lead compensations, Lag compensations, Lead-Lag compensations (theoretical concepts)

Overview of various transducers with their signal conditioning systems.

**UNIT-VI: State variable approach****(10)**

State variable method of analysis, state choice of state representation of vector matrix differential equation, standard form, relation between transfer function and state variable.

**Books:****Text Books:**

1. Control Systems Engineering, I.J. Nagrath, M. Gopal
2. Modern Control system (II Edition) – Katsuhiko Ogata
3. Control systems by Smarajit Ghosh (second Edition, Pearson Education)

**Reference Book:**

1. Automatic Control system (II Edition) – Benjamin C, Kuo, PHI
2. Modern Control System, Drot, Bishop, Wesly Publication
3. Control system Engineering, S.K. Bhattacharya, Pearson Education.

## B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

### DIGITAL COMMUNICATION

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

**Subject Code: BEENE604T/ BEECE604T/ BEETE604T**

**[4 – 0 – 1 – 5]**

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#### **Objectives:**

The Course Objectives are:

1. To study basic components of digital communication systems.
  2. To understand the designing aspects of optimum receivers for digital modulation techniques.
  3. To study the analysis of error performance of digital modulation techniques.
  4. To study the designing of digital communication systems under given power, spectral and error performance constraint
- 

#### **Outcome:**

After completing this course students shall be able to:

1. Explain the working principles of basic building blocks of a digital communication system.
  2. Describe a random process in terms of its mean and correlation functions and characterize special Gaussian and Rayleigh distributions.
  3. Explain receiver techniques for detection of a signal in AWGN channel
  4. Describe digital modulation techniques.
  5. Demonstrate the concept of coding and decoding techniques.
  6. Model digital communication systems using appropriate mathematical techniques.
  7. Describe spread spectrum analysis.
- 

#### **UNIT-I:-Digital Communication Concept**

**(10)**

Review of Random variables, PDFs & CDFs, Central limit Theorem. Model of digital communication system, Gram Schmitt Orthogonalization procedure, signal space concept, Geometric interpretation of signals, probability of error, correlation receiver, matched filter receiver.

#### **UNIT-II: - Source & Waveform Coding Methods**

**(10)**

Source coding Theorem, Huffman coding-Z encoding algorithm, rate distortion theory for optimum quantization, scalar & vector quantization.

Waveform coding methods: ADPCM, Adaptive Sub-Band & Transform coding, LP & CELP coding.

**UNIT-III:-Digital Modulation Techniques (10)**

Coherent Binary: QPSK, MSK, Gaussian MSK, DPSK, Memory less modulation methods, linear modulation with memory, nonlinear modulation methods with memory: CPFSK, CPM.

**UNIT-IV:-Channel Coding (PART-1) (10)**

Introduction to Galois field, Construction of Galois field GF (2<sup>m</sup>) & its basic properties. Types of error control: Forward error correction (FEC), Automatic repeat request system (ARQ). Convolution encoding and decoding distance properties, Viterbi algorithm and Fano algorithm.

**UNIT-V: - Channel Coding (PART-II) (10)**

Trellis coded modulation, Introduction to Turbo coding, & Reed Solomon Codes: encoding & decoding, Low density parity check coding (LDPC)

**UNIT-VI: (10)**

Spread - Spectrum methods: - Study of PN sequences, direct sequence methods, Frequency hop methods, slow and fast frequency hop, performance analysis, synchronization methods for spread spectrum. Application of spread spectrum, CDMA, Introduction to OFDM

**Books:****Text Books:**

1. Digital communication: John G Proakis (TMG)
2. Digital communication: Simon Haykin (WEP)

**Reference Books:**

1. Lathi B.P. - Modern Digital and Analog communications systems - PRISM Indian Ed.
2. Digital Communication: J.S.Chitode
3. Digital Communication (Fundamentals & applications): Bernard Scalr
4. Introduction to Error Control Codes: Salvatore Gravano
5. OFDM For wireless communication systems: Ramjee Prasad
6. Modern Communication systems (Principles and application): Leon W. Couch II (PHI)
7. Error Control Coding: Shu Lin & Daniel J.Costello

**B. E. Sixth Semester**

**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**DIGITAL COMMUNICATION**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25 Marks**

**Subject Code: BEECE604P/ BEETE604P**

**[0 – 2 – 0 – 2]**

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**Objectives:**

1. To study the concept of communication based on RF-AF in digital domain.
  2. To study the role of sampling factor for analyzes the digital communication systems.
  3. To study & Design the digital communication systems.
  4. To study line coding and its application.
- 

**Outcome:**

At the end of the course the students shall be able to:

1. Describe the concept of the digital communication based design for testing and analyze the circuits.
  2. Design and conduct experiments for testing digital communication circuits and systems.
  3. Analyze the different coding technique for design and modeling of digital communication  
Identify, formulate and solve digital communication circuits and systems problems.
- 

**Any TEN practicals are to be conducted**

**LIST OF EXPERIMENTS**

1. To Study and perform Error Detection and Correction codes.
2. To study the performance of adaptive Delta modulator/De-modulator circuits.
3. To Study and observe the effect of signal Distortion using EYE-Diagram.
4. To study generation & reception of BPSK & perform its spectral analysis.
5. To study generation & reception of FSK & perform its spectral analysis.
6. To study generation & reception of QPSK & perform its spectral analysis.
7. To study generation & reception of MSK & perform its spectral analysis.
8. To study generation & reception of DPSK & perform its spectral analysis.
9. To study Detection of digital baseband signal using matched filter in the presence of noise.

10. To study Frequency Hop spread spectrum Transmission & Reception.
11. To write and execute Matlab code for Convolutional Encoder and Decoder.
12. Write and execute Matlab code for generation of BPSK / Prepare Simulink Model for BPSK.
13. Write and execute Matlab code for generation of FSK / Prepare Simulink Model for FSK.
14. Write and execute Matlab code for generation of QPSK / Prepare Simulink Model for QPSK.

**Note: Use DSO, Spectrum Analyzer, Logic Analyzer wherever necessary.**

**R.T.M.N.U Nagpur**  
**(Electronics & Communication/ Electronics &**  
**Telecommunication Engineering)**

**BEECE605T/  
BEETE605T**

| Sr.<br>No. | Subject Code            | Subject            | Workload |           |          |                | Credit  |           |          | Theory<br><i>Sessional<br/>University</i> | Practica<br>1<br><i>Sessional<br/>University</i> | Marks<br><i>Total<br/>Marks</i> |    |
|------------|-------------------------|--------------------|----------|-----------|----------|----------------|---------|-----------|----------|---|--|---------------------------------|----|
|            |                         |                    | Lecture  | Practical | Tutorial | Total Hrs/Week | Lecture | Practical | Tutorial |   |  |                                 |    |
| 1          | BEECE605T/<br>BEETE605T | Functional English | 2        | -         | 1        | 3              | 2       | -         | 1        | 3   | 10   | 40                              | 50 |

**Syllabus:**

**Unit 1. Functional Grammar: (4 Hours) ( 3+3+4=10 )**

Common errors , Transformation of Sentences, Phrases, Idioms & Proverbs. [ 50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

**Unit II. English for Competitive Exams & Interview Techniques: (6 Hours) (3+3+4=10 )**

IPA (vowel & consonant phonemes), Word building [ English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment : [ 25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for ]

**Unit III**

**(A) Formal Correspondence (4 Hours) (5X2=10)**

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes  
[Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

**(B) Analytical comprehension: (4 Hours)**

[Four fictional & four non-fictional unseen texts]

**Unit IV. Technical & Scientific Writing: (4 Hours) (5X2=10)**

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: ( Any one project/review as assignment)

**Total number of periods required = 22 for each Branch of Engineering**

**Reference Books:**

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal , Cambridge University Press
4. *Contemporary Business Communication* by Scot Ober , Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3<sup>rd</sup> edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

**EVALUATION PATTERN:**

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

**Question pattern for end semester examination**

| Unit No           | Q. No                  | Question type                        | No. of Questions                           | Weightage |
|-------------------|------------------------|--------------------------------------|--|-----------|
| Unit 1            | 1(A)<br>1(B)<br>1( C)  | objective<br>objective<br>objective  | 3 out of 5<br>3 out of 5<br>4 out of 6     | 3+3+4=10  |
| Unit 2            | 2 (A)<br>2(B)<br>2( C) | objective<br>objective<br>subjective | 3 out of 5<br>3 out of 5<br>1 ( no choice) | 3+3+4=10  |
| Unit 3 &<br>Unit4 | 3 (A)<br>3(B)          | Subjective<br>subjective             | 1 set (out of 2 sets)<br>1(no choice)      | 5<br>5    |
| Unit 5            | 4(A)<br>4(B)           | subjective<br>subjective             | 1 out of 2<br>1 out of 2                   | 5<br>5    |



## B. E. Sixth Semester

(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)

### Electronics Workshop Practice

Duration: 2 Hrs.

College Assessment: 25Marks

University Assessment: 25 Marks

**Subject Code: BEECE606P/ BEETE606P/ BEENE606P**

**[0 – 2 – 0 – 2]**

#### **Objectives:**

1. To make students familiar with measuring instruments like CRO, DSO, signal Generator.
2. To make students familiar with Interfacing Peripheral with computer.
3. To understand PCB Designing process
4. To enable students to design & fabricate their own Hardware.

#### **Outcome:**

At the end of the course the students shall be able

- to: 1. Use DSO and Spectrum Analyzer.
2. Interface peripherals with computer.
3. Design PCB using PCB designing software.
4. Design & fabricate mini project.

**Practical 1: Study of Functioning of Spectrum Analyzer and Digital Storage oscilloscope.** (2 Hrs.)

**Practical 2: Study of different Electronic components.** (2 Hrs.)

**Practical 3: Printed Circuit Boards (PCB):** (4 Hrs.)

Types, Layout procedure, artwork, Fabrication (In this, fabrications of small circuit Using discrete component on single side PCB is expected).

**Practical 4: Interfacing of displays (LCD, LED, 7 Segment) with PCs** (2 Hrs.)

**Practical 5: Hardware Mini Project** (14 Hrs.)

- Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog **application circuit**.
- Mini Project work should be carried out by a group of maximum **three** students.
- Student should use standard software available for drawing circuit schematic, simulating the design and PCB (**single/double sided**) layout of circuit.
- Project report should consist of details of work carried out including **layouts, circuits, datasheets, list of components, cost** .

#### **Reference Books:**

1 Electronic Instruments and Instrumentation Technology

2. A course in Electrical and Electronics Measurements and Instrumentation - A.K. Sawhney - Dhanpat Rai & Co.

3. Electronic Components and Materials - Dr. Madhuri A. Joshi - Shroff Publications Third Edition

4. Electrical and Electronic Measurements –Banerjee,PHI

5. Introduction to Measurements and Instrumentation, 4th edition- Ghosh PHI 6.

Electronic Instrumentation and Measurement Techniques, W.D. Copper,PHI

**Web Resources:** Refer online datasheets

**B. E. Sixth Semester**

**(Electronics / Electronics & Communication/ Electronics & Telecommunication Engg)**

**Industrial Visit**

**Duration: 2 Hrs.**  
**College Assessment: G(Grade)**

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**Subject Code: BEENE607P /BEECE607P/ BEETE607P**

**[0 – 2 – 0 – 2]**

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**Objectives:**

To provide industry exposure to students.

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**Outcome:**

The students shall be able to apply this knowledge during their project and may be useful in future.

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**In industrial visit it is expected that**

1. Student should visit the industry
2. Based on their interaction, experience during this Industrial visit they should prepare technical report with photograph and certificate from industry.

## B. E. Seventh Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

### DSP PROCESSOR & ARCHITECTURE

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEECE701T/ BEETE701T/ BEENE701T

[4 – 0 – 1 – 5]

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#### Objectives:

1. To study Programmable DSP Processors.
  2. To provide an understanding of the fundamentals of DSP techniques.
  3. To study implementation & applications of DSP techniques.
  4. To study multi-rate filters.
  5. To understand architecture of DSP processor..
- 

Outcome: By the end of the course, the students shall be able

1. to describe the detailed architecture, addressing mode, instruction sets of TMS320C5X
  2. to write program of DSP processor.
  3. to design & implement DSP algorithm using code composer studio
  4. to design decimation filter and interpolation filter.
- 

#### UNIT 1 : FUNDAMENTALS OF PROGRAMMABLE DSPs

(10)

*Multiplier and Multiplier accumulator, Modified Bus Structures and Memory access in P-DSPs, Multiple access memory , Multi-ported memory , VLIW architecture, Pipelining , Special Addressing modes in P- DSPs , On chip Peripherals, Computational accuracy in DSP processor, Von Neumann and Harvard Architecture, MAC*

#### UNIT 2 : ARCHITECTURE OF TMS320C5X

(08)

Architecture, Bus Structure & memory, CPU, addressing modes, AL syntax.

#### UNIT 3 : Programming TMS320C5X

(10)

*Assembly language Instructions , Simple ALP – Pipeline structure, Operation Block Diagram of DSP starter kit , Application Programs for processing real time signals.*

#### UNIT 4 : PROGRAMMABLE DIGITAL SIGNAL PROCESSORS:

(12)

*Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of S320C54XX Processors, Program Control, On-chip peripheral, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors , Block diagrams of internal Hardware, buses , internal memory organization.*

**UNIT 5: ADVANCED PROCESSORS** **(07)**

*Code Composer studio - Architecture of TMS320C6X - architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.*

**UNIT 6: IMPLEMENTATION OF BASIC DSP ALGORITHMS:** **(08)**

Study of time complexity of DFT and FFT algorithm, Use of FFT for filtering long data sequence, Interpolation filter, Decimation filter , wavelet filter .

**Text- Books:**

1. B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and TMH, 2004.
2. Avtar Singh, S.Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX -Thamson 2004.
3. E.C.Ifeachor and B.W Jervis, Digital Signal Processing - A Practical approach, Pearson Publication
4. Salivahanan. Ganapriya, Digital signal processing, TMH , Second Edition

**Reference Books:**

1. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. , S. Chand & Co, 2000.
2. Digital signal processing-Jonathen Stein John Wiley 2005.
3. S.K. Mitra, Digital Signal Processing, Tata McGraw-Hill Publication, 2001.
4. B. Venkataramani, M. Bhaskar, Digital Signal Processors, McGraw Hill

**B. E. Seventh Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**DSP PROCESSOR AND ARCHITECTURE**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25Marks**

**Subject Code: BEENE701P/ BEECE701P/ BEETE701P**

**[0 – 2 – 0– 2]**

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**Objectives:**

- 1. The DSP algorithms are better implemented on DSP processors having specially tailored architectures.**
  - 2. It enables the designers to understand different processors and apply them in system design**
- 

**Outcome: The students shall be able to**

- 1. Understand the architecture of TMS and Motorola Processors.**
  - 2. Implement different processing algorithms on DSP processors.**
  - 3. Design different types of filters and study their characteristics.**
- 

**Any Eight practicals are to be conducted**

**LIST OF EXPERIMENTS**

- 1. To study architecture of *TMS320C54XX* & Motorola *DSP563XX***
- 2. To generate basic signals using *TMS320C54XX* .**
- 3. Write an ALP using instruction of TMS processors to add two numbers.**
- 4. Write ALP to subtract two numbers.**
- 5. Write an ALP to multiply two numbers of unsigned 32 bit data.**
- 6. Write an ALP to divide 16 –bit data by an eight bit data.**
- 7. Implementation of FFT using code Composer studio.**
- 8. To implement Interpolation filter by Matlab.**
- 9. To implement Decimation filter by Matlab.**
- 10. To design FIR filter using MATLAB and find finite word length effect & cross verify using DSP processor.**
- 11. To design IIR filter using MATLAB and find finite word length effect & cross verify using DSP Processor.**

**B. E. Seventh Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**TELEVISION AND VIDEO ENGINEERING**

**Duration: 3 Hrs.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE702T/ BEETE702T**

**[4 – 0 – 1 – 5]**

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**Objectives:**

1. To make students understand /explain the analysis and synthesis of T.V. system
  2. To study various colour TV system with greater emphasis on PAL T.V.system.
  3. To study Advance Technology of TV Engineering –Digital T.V., HDTV.
  4. To study various video recording system, display system and its application.
- 

**Outcome: By the end of the course, the students shall be able to**

1. analyze and understand colour T.V. System
  2. understand fundamental techniques of Different T.V. standards.
  3. understand Advanced T.V. Technology.
  4. understand different video recording, display and its consumer application.
- 

**Unit 1: Fundamentals of Television and Display**

**(10)**

*Television basics: Elements of TV system, low level TV transmission, TV receiver block diagram , Production of luminance & colour difference signal , Composite video signal, and channel bandwidth etc.., Color TV systems, colour fundamentals, mixing of colors , color perception, chromaticity diagram.*

**Unit 2: TV Standards**

**(08)**

*NTSC, PAL, SECAM systems, colour TV transmitter, colour TV receivers, remote control, antennas for transmission and TV pattern generation.*

**Unit 3: Digital TV**

**(10)**

*Introduction to Digital TV, Principle of Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG1, MPEG2, MPEG4.*

**Unit 4: HDTV**

**(10)**

*HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite Systems, CCTV, CATV, direct to home TV, set top box with recording facility, 3D TV systems.*

**Unit 5: Video Recorders****(10)**

*IP Audio and Video, IPTV systems, Mobile TV, Video transmission in 3G mobile System, Digital Video Recorders, Video Projectors, HD Video projectors, Video Intercom systems.*

**Unit 6: Consumer Applications****(07)**

*Colour TV Digital cameras, Camcorders, Handycams, and Digicams, Display devices: LED, LCD, CD/DVD player, Blue Ray DVD Player, Dish TV.*

**Text Books**

1. Television and video Engineering, A. M. Dhake, Tata McGraw Hill Publication.
2. Video Demisified, Kelth jack, Penram International Publication.
3. Audio Video Systems, R.G. Gupta, Technical Education.

**Reference Books**

1. S. P. Bali, "Color TV Theory and Practice", McGraw Hill Publications.
  2. Bernard Grob, Charles E, "Basic TV and Video Systems" McGraw Hill Publications.
  3. Gulathi, "Monochrome & Color TV", New Age International Publications .
  4. R.G. Gupta, "Television Engineering & Video Systems", McGraw Hill Publications
-

**B. E. Seventh Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**TELEVISION AND VIDEO ENGINEERING**

**Duration: 2 Hrs.**  
**College Assessment: 25 Marks**  
**University Assessment: 25Marks**

**Subject Code: BEECE702P/ BEETE702P**

**[0 – 2 – 0– 2]**

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**Objectives:**

1. To perform practical at a comprehensive coverage of Television Systems with all the new developments in Television Engineering
  2. To study and observe the RF based Transmission and Receptions in Audio and Video Mode
  3. To develop necessary expertise in handling hardware projects related television subject.
  4. To train students in operating and maintenance of all the sophisticated and latest equipment and machinery related to this subject.
- 

**Outcome: By the end of the course, the students shall be able to**

1. Study and classify the concept of troubleshoot and repair
  2. Develop an understanding of electronics, mechanical and environmental factors involved in maintaining television equipment.
  3. Analyze and synthesize TV Pictures, Composite Video Signal, TV Receiver Picture Tubes
- 

**Any EIGHT practicals are to be conducted**

**LIST OF EXPERIMENTS**

1. To study & understand TV Receiver block diagram & analyze and synthesize TV Pictures.
2. To study & understand the color composite video signal.
3. To study & understand the RF tuner section & measure the voltage at different test points.
4. To study & understand the VIF & SIF section & measure the voltage at different test points.
5. To study & understand the chroma section & measure the voltage at different test points.
6. To study & understand the vertical & horizontal section & measure the voltage at different test points.
7. To study & understand the EHT section.
8. To study & understand power supply section of colour TV system.
9. To study & understand the different patterns with the help of pattern generator.
10. Case study of live broadcasting (e.g. Cricket match/football match).
11. To study & understand HDTV standards.
12. To study & understand various faults and trouble shooting of colour T.V.
13. To study & understand different TV receiver picture tube.
14. To study & understand Digital TV satellite System.

**B. E. Seventh Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**OPTICAL COMMUNICATION**

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE703T/ BEETE703T/ BEENE703T**

**[4 – 0 – 0 – 4]**

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**Objectives:**

1. To understand optical fiber technology to sophisticated modern telecommunication systems.
  2. To understand the fundamental behavior of the individual optical components, describes their interactions with other devices in an optical fiber.
  3. To measure & analyze different measurements, parameters & properties of optical fiber.
- 

**Outcome: By the end of the course, the students shall be able to**

1. learn the basic elements of optical fiber.
  2. understand the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors.
  3. classify various optical source materials, LED structures, LASER diodes.
  4. learn the fiber optic receivers such as PIN, APD diodes, receiver operation & performance.
  5. understand the operational principle of WDM, SONET, measurement of attenuation, dispersion, refractive index profile in optical fibers.
- 

**UNIT I : OVERVIEW OF OPTICAL FIBER COMMUNICATION**

**(05)**

*Introduction, advantages, disadvantages and applications of optical fiber communication, Ray theory, classification of Optical Fibers*

**UNIT II: TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS**

**(10)**

*Fiber manufacturing & Fiber materials, manufacturing methods, Attenuation, Absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.*

**UNIT III: OPTICAL SOURCES AND COUPLERS & CONNECTORS OF FIBER**

**(08)**

*Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.*

**Optical sources:** LED's, LASER diodes.

**UNIT IV: OPTICAL DETECTORS AND RECEIVER**

**(06)**

*Photo detectors, Photo detector noise, Response time, comparison of photo detectors*

*Optical Receiver Operation, receiver sensitivity, quantum limit, coherent detection, burst mode receiver operation, Analog receivers*

**UNIT V: ANALOG AND DIGITAL LINKS****(08)**

*Analog links – overview of analog links, CNR, multichannel transmission techniques, Digital links – point-to-point links, System considerations, link power budget, rise time budget, transmission distance for single mode links.*

**UNIT VI : WDM CONCEPTS AND COMPONENTS****(08)**

*Operational Principles of WDM, basic applications and types of optical amplifiers, semiconductor optical amplifiers, EDFA. Measurement of Attenuation and dispersion. Study of various application of optical fiber communication.*

**TEXT BOOKS:**

1. "Optical Fiber Communication", Gerd Keiser, 3rd Ed., McGraw Hill,
2. "Optical Fiber Communications", John M. Senior, Pearson Education. 3rd Impression, 2007.

**REFERENCE BOOK:**

1. Fiber Optic Communication - Joseph C Palais: 4th Edition, Pearson Education.
  2. "TextBook on Optical Fiber Communication & its Application", S.C. Gupta, PHI Publications
  3. "Optical Communication & Networks", M.N. Bandopadhyay, PHI Publications
-

**B. E. Seventh Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**Advanced Digital System Design**

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code BEECE704T/ BEETE704T/BENE704T**

**[4 – 0 – 1 – 5]**

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**Objectives:**

- 1. To motivate the students to learn basic foundation course in VHDL.**
  - 2. To address the challenges in Hardware design by discussing the role of digital components in system design**
  - 3. To concentrate on HDL based digital design ,HDL terminology, architecture and design of combinational and sequential circuit.**
  - 4. To learn about modeling of system tested with test benches & synthesis also implementation on FPGA/CPLD.**
- 

**Outcome: By the end of the course, the students shall be able to**

- 1. Design of combinational & sequential circuit.**
  - 2. Develop skilled VLSI front end designers**
  - 3. Implementation of digital system.**
  - 4. Experimentation on Hardware /Software co-design.**
- 

**UNIT I**

**(08)**

**INTRODUCTION TO DIGITAL SYSTEM DESIGN:** Device technologies, System representation, Levels of abstraction, Development tasks and EDA software, Development flow, Hardware description language, VHDL in development flow, Basic VHDL concepts.

**UNIT II**

**(10)**

**BASIC LANGUAGE CONSTRUCTS OF VHDL:** Skeleton/syntax of VHDL program, elements and program format, Objects, Data type and operators, Concurrent Signal Assignment, Combinational versus sequential circuits, Signal assignment statements, conditional signal assignment, Selected signal assignment, Conditional versus selected signal assignment statements.

**UNIT III:**

**(08)**

**SUBPROGRAM:**

Functions, Procedures, attributes, generic, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

**UNIT IV:** (10)

**FINITE STATE MACHINE:** Overview of FSM, FSM representation, Moore machine versus Mealy machine, VHDL representation of an FSM, State assignment, Some FSM design examples – sequence detector, FSM based binary counter.

Analysis of asynchronous sequential circuit – flow table reduction-races-state assignment-transition table and problems in transition table.

**UNIT V:** (09)

**HDL SYNTHESIS:** The Synthesis Concept, Timing Analysis of Logic Circuits, Efficient Coding Styles, Combinatorial Logic Synthesis, Partitioning for Synthesis, Pipelining Resource sharing, Optimizing arithmetic expressions. Power Analysis of FPGA based system.

**UNIT VI:** (10)

**Programmable Logic Devices:** Introduction to place & route process, Architecture of CPLD (Xilinx / Altera), FPGA XILINX 4000 Series ,Overview of PLDs, CPLD, FPGA, Design Examples: ALU, barrel shifter, 4\*4 Keyboard Scanner, multiplier.

**TEXT BOOKS:**

1. VHDL, 4<sup>rd</sup> Edition Douglas Perry –TMH
2. Fundamentals of Digital Logic with VHDL design –Stephen Brown, Zvonko Vranesic–TMH.
3. Digital Design Principles – Fletcher.
4. VHDL Synthesis –J Bhasker.
5. VHDL Primer–J Bhasker –Pearson Education.

**REFERENCE BOOKS:**

1. Digital System Design Using VHDL –Charles H. Roth, McGraw Hill Publications.
2. Digital System Design–John Wakerley, McGraw Hill Publications.
3. VHDL –Zainalabedin Navabbi, McGraw Hill publication
4. VHDL– D. Smith,
5. Digital Design with VHDL - Dr.S.S.Limaye, McGraw Hill Publications .

**B. E. Seventh Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

**Advanced Digital System Design**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25Marks**

**Subject Code: BEENE704P/ BEECE704P/ BEETE704P**

**[0 – 2 – 0– 2]**

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**Objectives:**

1. To acquire knowledge of computer-aided design tools for design of complex digital logic circuits.
  2. To analyze the results of logic and timing simulations and to use these simulation results to debug digital systems
- 

**Outcome:**

The student shall be able

1. to model, simulate, verify the digital model with hardware description language.
  2. to design and prototype with programmable logic devices
  3. to learn the modular design style to create large digital logic circuits.
  4. to create and simulate basic circuit modules (or macros) using VHDL.
- 

**Any EIGHT practicals are to be conducted**

**LIST OF EXPERIMENTS**

12. Design of basic logic gates using VHDL.
13. Design of full adder/substractor using VHDL.
14. Design of Multiplexer/ Demultiplexer using VHDL.
15. Design of Priority encoder using VHDL.
16. Design of BCD-to-Seven segment encoder.
17. Design of n-bit up-down counter.
18. Design of n-bit shift register using VHDL.
19. Design of sequence detector using Mealy FSM.
20. Design of sequence detector using Moore FSM.
21. Design of 4-bit ALU using VHDL.
22. Design & Implementation of 4-bit barrel shifter using FPGA / CPLD.
23. Design & Implementation of 4-bit multiplier using FPGA / CPLD.
24. Design & Implementation of 4 X 4 keyboard scanner using FPGA / CPLD.
25. Design of Asynchronous sequential circuit using VHDL.
26. Design & implement Mini project on FPGA/CPLD.

**All above practicals needs to perform test Bench verification & Synthesis Report.**

**B. E. Seventh Semester**

**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**ELECTIVE 1 - FUZZY LOGIC & NEURAL NETWORK**

**Duration: 3 Hr.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE705T/ BEETE705T**

**[ 3 – 0 – 1 – 4 ]**

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**Objectives:**

1. To provide the student with the basic understanding of neural networks and fuzzy logic fundamentals , Program the related algorithms and design the required and related systems
  2. To make the students well acquainted with Soft computing techniques, especially Fuzzy logic, Neural networks and Genetic algorithm
  3. To make the students able to identify the complex problems in conventional structures, obtain intelligent acceptable solutions for these problems using soft computing techniques and take the necessary corrective action in the light of ongoing events
- 

**Outcome: By the end of the course ,the students shall be able to**

1. Understand the adequate knowledge about feedback neural networks.
  2. Understand the concept fuzzy logic control to real time systems.
  3. provide adequate knowledge about fuzzy set theory.
  4. provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic
  5. study and understand defuzzification techniques.
  6. Understand and design genetic fuzzy controller.
  7. gain comprehensive knowledge of adaptive fuzzy system.
- 

**UNIT I : INTRODUCTION:**

**(10)**

*Fundamentals and Models of Artificial Neural Systems, Neural computation: Examples and applications, Biological neurons and their artificial models, Models of artificial networks, Neural processing, Learning and adaptation, Neural network learning rules, Overview of neural networks, Single Layer Perception , multilayer perception & its limitation.*

**UNIT II: MULTILAYER FEED FORWARD NETWORKS**

**(08)**

*Linearly non separable pattern classification, Delta learning rule for multi-perceptron layer, generalized delta learning rule, feed forward recall and error back propagation training, learning factors.*

**UNIT III: SINGLE LAYER FEEDBACK NETWORKS:****(07)**

*Basic concepts and dynamical systems, Mathematical foundations of discrete-time and gradient-type Hopfield networks*

**Application of Neural Networks:** control system application like washing machine, refrigerator, signal processing application like ECG, EMG, EEG.

**UNIT IV : INTRODUCTION TO FUZZY LOGIC****(08)**

*Uncertainty and imprecision, Classical sets and Fuzzy sets, Classical relation and fuzzy relations, Operations on crisp and fuzzy relations. Fuzzy tolerance and equivalence*

**UNIT V: FUZZYIFICATION AND DEFUZZIFICATION****(07)**

*Membership functions, Membership assignment, lambda cuts, Defuzzification methods, **Fuzzy Arithmetic:** Fuzzy numbers, vectors, extension principle, crisp functions, mapping, fuzzy transforms, interval analysis, fuzzy logic controller design.*

**UNIT VI: APPLICATIONS OF FUZZY LOGIC****(05)**

*Specific application in the field of control system and Image processing and signal processing, Design of genetic fuzzy controller.*

**TEXT BOOKS:**

1. J. M. Zurada, Introduction to Artificial Neural Networks, Jaico Publishing house.
- 2 T. M. Ross, Fuzzy logic, Mc-Graw Hill Inc.
3. Kosoko, Neural Networks and Fuzzy Systems, PHI Publications

**REFERENCE BOOKS:**

1. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
2. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.

3. Neural Fuzzy Systems, C.T Lin & C S George Lee, Prentice Hall.
4. Fuzzy Logic with Engineering Applications, Timothy J. Ross, 2<sup>nd</sup> edition, McGraw Hill.
5. Fuzzy Sets & Fuzzy Logic- Theory & Applications, George J. Klir, Bo Yuan , Prentice Hall Publications
6. Neural Network, Fuzzy Logic & Genetic Algorithm, S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI Publications.
7. Neural Networks – A classroom approach, Satish Kumar, McGraw Hill
8. Neural Network Design - Martin T. Hagan, Cenage Learning

## B. E. Seventh Semester

(Electronics & Communication/ Electronics & Telecommunication Engg)

### ELECTIVE 1 - MICROELECTROMECHANICAL SYSTEMS AND SYSTEM ON CHIP

Duration: 3 Hr.  
College Assessment: 20 Marks  
University Assessment: 80 Marks

Subject Code: BEECE705T/ BEETE705T

[ 3 – 0 – 1 – 4 ]

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#### Objectives:

1. To understand Standard microfabrication techniques and the issues surrounding them.
  2. To understand Major classes, components, and applications of MEMS devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems
  3. To understand microfabrication techniques and applications to the design and Manufacturing of an MEMS device or a microsystem
- 

#### Outcome: By the end of the course, the students shall be able to

1. Understand working principles of currently available microsensors, actuators used in Microsystems.
  2. Apply scaling laws that are used extensively in the conceptual design of micro devices and systems.
  3. Understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
  4. Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process
  5. Consider recent advancements in the field of MEMS and devices
- 

#### UNIT 1: Introduction to MEMS

(06)

Benefits of Miniaturization, Types of MEMS: Optical MEMS, Bio- MEMS, RF- MEMS, Microfluidics, Success Stories, Pressure sensor, Accelerometer, Micro-mirror TV Projector

#### UNIT 2 : Microfabrication and Micromachining

(08)

Integrated Circuit Processes, Bulk Micromachining, Surface LIGA process , wet & dry etching processes , Device fabrication using Surface Micromachining example, Microcantilever fabrication

#### Unit 3: Transducers

(10)

*Chemical and Biological Transducers: basic concepts of cellular biology, chemical sensors, molecule-based biosensors, cell-based biosensors, chemical actuators, biological transducers and electrophoresis: optical transducers, thermal transducers, magnetic transducers, RF transducers.*

#### UNIT 4: RF MEMS Devices

(08)

Capacitor, Inductor, Switches, and antennas, RF MEMS components in communications, space and defense applications

**UNIT 5: Micro System Packaging****(06)**

Overview of mechanical packaging of microelectronics micro-system packaging.

**UNIT 6: Introduction to system-on-chip****(07)**

Design of system on chip, Microsystems technology and applications, core architecture for digital media and the associated compilation techniques

**TEXT BOOKS:**

1. " Micro and Smart Systems", Ananthasuresh, G. K., Vinoy, K. J., Gopalakrishnan, S., Bhat, K. N., and Aatre V.K., Wiley-India, NewDelhi, 2010.
2. . "Micromachined Transducers Sourcebook" , Kovacs, Gregory T. A, McGraw-Hill Publications

**REFERENCE BOOKS:**

1. VLSI Technology, Sze S.M. (ed), McGraw Hill Publications
2. RFMEMS and Their Applications: Vijay Varadan, K. J. Vinoy, K. A. Jose, Wiley, 2002.
3. "MEMS Practical Guide to Design, analysis and Applications", Jan G Korvinik and Oliver Paul William Andrew, Inc Springer.
4. "MEMS & Microsystem Design and Manufacture", Tai-Ran Hsu, McGraw Hill Publication
5. "MEMS", Nitaigour Premchand Mahalik, McGraw Hill Publications

**B.E. Seventh Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**ELECTIVE 1 - DATA COMPRESSION & ENCRYPTION**

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEECE705T/ BEETE705T

[ 3 – 0 – 1 – 4 ]

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**Objectives:**

1. To understand the different text compression technique.
  2. To study the various audio compression scheme.
  3. To verify different video compression & image compression methods.
  4. To have the knowledge of various encryption technique.
  5. To acquire the information about different authentication technique.
- 

**Outcome:** By the end of the course, the students shall be able to

1. implement various text, audio, video, compression technique.
  2. provide various authentication using digital communication.
  3. gain the knowledge of encryption techniques application to digital communication.
- 

**Unit 1 : TEXT COMPRESSION**

**(08)**

*Shannon Fano Coding, Huffmann coding, Arithmetic coding and dictionary techniques-LZW, family algorithms, Entropy measures of performance and Quality measures.*

**Unit 2 : AUDIO COMPRESSION**

**(08)**

*Digital Audio, Lossy sound compression,  $\mu$ -law and A-law companding, DPCM and ADPCM audio compression, MPEG audio standard, frequency domain coding, format of compressed data.*

**Unit 3 : IMAGE AND VIDEO COMPRESSION**

**(08)**

*Lossless techniques of image compression, gray codes, Two dimensional image transforms, JPEG, JPEG 2000, Predictive Techniques PCM and DPCM. Video compression and MPEG industry standard.*

**Unit 4 : CONVENTIONAL ENCRYPTION**

**(08)**

*Introduction, Types of attacks, Steganography, Data Encryption Standards, Block Cipher Principle, S-box design, triple DES with two three keys.*

**Unit 5: PUBLIC KEY ENCRYPTION AND NUMBER THEORY****(08)**

*Euler's theorems, Chinese remainder theorem, Principles of public key cryptography, RSA algorithm, Diffie-Hellman Key Exchange. Elliptic curve cryptology, message authentication and Hash functions, Hash and Mac algorithms, Digital signatures.*

**Unit 6: SYSTEM SECURITY & CASE STUDIES****(05)**

*Intruders, Viruses, Worms, firewall design, antivirus techniques, digital Immune systems, Certificate based & Biometric authentication, Secure Electronic Payment System.*

**Text Books**

1. Data Compression – David Salomon, Springer Publication, 4th Edition.
2. Introduction to Data Compression – Khalid Sayood, Morgan Kaufmann Series, 3rd Edition
3. Cryptography and Network Security – William Stallings, Pearson Education Asia Publication,
4. Cryptography and Network Security – Behrouz Forouzan, McGraw-Hill, 1<sup>st</sup> Edition.

**Reference Books:**

1. The Data Compression Book – Mark Nelson, BPB publication, 2nd Edition
2. Applied Cryptography – Bruce Schnerer, John Willey & Sons Inc. Publication, 2nd Edition
3. Cryptography & Network Security – Atul Kahate, Tata McGraw Hill, 2nd Edition
4. Cryptography and Network Security – Behrouz A. Forouzan , Special Indian Addition, SIE
5. Network Security & Cryptography – Bernard Menezes, Cenage Learning

**B. E. Seventh Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**ELECTIVE 1 - VLSI SIGNAL PROCESSING**

**Duration: 3 Hr.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE705T/ BEETE705T**

**[3 – 0 – 1 – 4]**

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**Objectives:**

1. To learn pipelining & parallel processing techniques.
  2. To understand folding & unfolding techniques in multirate system
  3. To address folding techniques used to design time multiplexed architecture.
- 

**Outcome: By the end of the course, the students shall be able to**

1. Learn various methodologies to optimize power delay and area of VLSI design.
  2. Build Real Time processing system.
  3. Design of algorithm structure for DSP algorithms based on algorithm transformation.
- 

**Unit I: Pipeling and Parallel Processing** **(08)**

Introduction, pipeling of FIR Digital filters Parallel processing, Pipelining and parallel processing for low power.

**Unit II: Retiming** **(06)**

Introduction, Definition and properties, solving system of inequalities, retiming techniques.

**Unit III: Unfolding** **(08)**

Introduction, algorithms for unfolding, Properties of unfolding, Critical path, unfolding and retiming Application of unfolding.

**Unit IV: Folding** **(08)**

Introduction Folding Transformation, Register minimization in folded architectures, Folding in Multirate systems.

**Unit V: Fast Convolution** **(08)**

Introduction, Cook- Toom algorithm, Winogard algorithm.

**Unit VI:** **(07)**

Iterated convolution, Cyclic Convolution, Design of Fast Convolution Algorithm by Inspection.

**Text Books:**

1. Keshab K. Parhi. "VLSI Digital Signal Processing Systems" Wiley-Inter Sciences. 1999
2. Mohammed Ismail, Terri, Fiez, "Analog VLSI signal and information processing", McGraw Hill ,1994.
3. Keshab. Parthi, "VLSI Digital signal processing system Design and implementation" Wiley-  
Inter science, 1999.
4. kung. S.Y., H.J. While house T.Kailath "VLSI and Modern singal processing", prentice hall,  
1985.
5. Jose E. France, Yannis Tsividls "Design of Analog Digital VLSI circuits for telecommunications and  
signal processing" prentice Hall, 19994.

**B. E. Eighth Semester**

**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**MICROWAVE & RADAR ENGINEERING**

**Duration: 3 Hr.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE801T/ BEETE801T**

**[ 4 – 0 – 0 – 4 ]**

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**Objectives**

1. To understand the principles of the advanced microwave engineering
  2. To design of passive and active microwave components and microwave circuits including: micro strip line, guided wave device
  3. To study Klystron amplifier and oscillator.
  4. To learn working principle of Radar system.
  5. To understand the radio wave propagation and interference in mobile communications..
  6. To get knowledge and relate different components in Radar and use them in projects.
- 

**Outcome:** At the end of the course the student should be able to:

1. Understand the use of active and passive microwave devices
  2. Analyze Different UHF components with the help of scattering parameter.
  3. Understand micro strip lines MIC design
  4. Understand the use of different Klystrons.
  5. Analyze the different power distribution Tees.
  6. Analyze Scattering Matrix of different UHF components.
  7. Do research with capabilities in the design, development and manufacture of radar systems used in a wide spectrum of applications.
  3. Able for Acquisition of technical competence in specialized areas of Radar engineering.
  4. Able to identify, formulate and model problems and find Radar engineering solutions based on a system approach
- 

**Unit 1: Microwave Tubes**

**(08)**

*High frequency limitations of conventional tubes, Two Cavity and multi cavity Klystrons, Reflex Klystrons, slow-wave structure: TWT, BWO, Magnetron oscillator and its types.*

**Unit 2: Microwave Components**

**(10)**

*Introduction to rectangular waveguide & waveguide excitation ,Principles of S-parameters, S-parameters for multi-ports (2-port, 3-port, 4-port etc.) properties of S-matrix, waveguide Tees (E, H, E-H planes), Directional Couplers, matched terminations, Microwave attenuators, Slotted line, Ferrite devices, Circulators, Isolators, gyrators.*

**Unit 3: Solid State Microwave Devices**

**(06)**

*Parametric amplifiers, PIN diodes, Transferred Electron devices: Gunn diode, Avalanche diode, Transit Time devices like IMPATT, TRAPATT diodes.*

**Unit 4: Microwave measurement****(08)**

*Introduction to microwave measurements, definition and measurement methods of frequency, power, attenuation, VSWR, impedance, insertion loss, dielectric constant, Q of a cavity resonator, phase shift.*

**Unit 5: Radar Fundamentals****(06)**

*Basic principles and fundamentals of Radar , block diagram of basic radar, classification, radar performance factors, radar range equation, factors influencing maximum range, effects of noise, Pulsed radar systems.*

**Unit 6:****(07)**

*Antennas and scanning, display methods, moving target indication, radar beacons, CW Doppler radar, FM CW phased array radars, applications of radar*

**Text Books**

1. S.Y. Liao, "Microwave Devices and Circuits", Prentice Hall India.
2. Skolnik, "Principles of Radar Engineering", McGraw Hill Publications
3. David M. Pozar, "Microwave Engineering", John Wiley & Sons.

**Reference Book**

1. G.S.Raghuvanshi "Microwave Engineering", Cengage India Publications .
2. R.S. Rao, "Microwave Engineering", PHI Publications
3. Annapurna Das, Sisir Das, "Microwave Engineering", McGraw Hill Publications

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**MICROWAVE AND RADAR ENGINEERING**

**Duration: 2 Hrs.**  
**College Assessment: 25 Marks**  
**University Assessment: 25Marks**

**Subject Code: BEECE801P/ BEETE801P**

**[0 – 2 – 0– 2]**

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**Objectives:** The objective of this course is to understand the practical concept of microwave engineering  
2. To Understand different Power distribution Waveguide and Scattering Matrix.  
3. To know about Microwave and its Application.  
4. To Study different Microwave Filters.

---

**Outcome:**

At the end of the course the students shall be able to:

1. Describe working of microwave bench.
  2. Measure power & VSWR of microwave component.
  3. Analyze the S-parameter of microwave component.
- 

**Any EIGHT practicals are to be conducted**

**LIST OF EXPERIMENTS**

1. Study the characteristics of Klystron Tube and to determine its electronic tuning range.
2. To study the V-I characteristics of Gunn Diode.
3. To study the following characteristics of Gunn Diode.
  - (a) Output power and frequency as a function of voltage.
  - (b) Square wave modulation through PIN diode.
4. Study the function of Magic Tee by measuring the following parameters.
  - (a) Measurement of VSWR at different ports and
  - (b) Measurement of isolation and coupling coefficient.
5. Study the function of Isolator / Circulator by measuring the following parameters.
  - (a) Input VSWR measurement of Isolator / Circulator.
  - (b) Measurement of insertion loss and isolation.
6. Study the function of Attenuator (Fixed and Variable type) by measuring the following parameters.
  - (a) Input VSWR measurement.
  - (b) Measurement of insertion loss and attenuation.
7. Study the function of Multi Hole Directional Coupler by measuring the following parameters.
  - (a) To measure main line and auxiliary line VSWR.
  - (b) To measure the coupling factor and directivity.
8. Study of a network analyzer and measurements using it.
9. Verification of port characteristics of Microwave Tees (E, H, E-H planes)

10. Verification of port characteristics of Directional Coupler, study of Coupling factor, Insertion loss and Directivity.
  11. To plot the radiation pattern of Horn Antenna and calculate its Antenna Gain and Beam width.
  12. To plot the radiation pattern of Dish Antenna and calculate its Antenna Gain and Beam width.
  13. Simulation of detection of target (i.e.to find distance and position of the target )
  14. Simulation of Doppler effect (for moving target).
  15. Study of different tracking Radar System (Mono pulse / conical scan / pulse swapping Radar)
  16. Study of different types of Antenna ( cassegain antenna /Parabolic Antenna)
  17. Study of Servo-mechanism for Antennas of Radar Syatem.
  18. Study of Pulse Radar System.
  19. Study of FMCW Radar System.
  20. Study of MTI Radar System.
- .

## B. E. Eighth Semester

(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)

### COMPUTER COMMUNICATION NETWORK

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE802T/ BEETE802T/ BEENE802T**

**[4 – 0 – 1 – 5]**

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#### **Objectives:**

1. To explain the basic concept of computer communication network.
  2. To explain the computer network layer.
  - 3 To explain IP addressing scheme.
  4. To explain network process.
  5. To study Hardware aspect of network communication.
  6. To make selection of IEEE LAN standards.
  7. To explain network security & administration.
- 

#### **Outcome: By the end of course, the students shall be able to**

1. Understand the requirement of theoretical & practical aspect of computer network.
  2. Understand the network traffic in computer network.
  3. Describe various protocols used in network.
  4. Describe the concept of computer network security.
  5. Understand the different wired & wireless LAN stds. & Routers.
- 

#### **Unit 1: Introduction to Computer Networks**

**(06)**

*Uses of computer Network, Network Software-design Issues for layers, Service primitives and relationship of services to Protocols, Reference models-OSI & TCP/IP, network architectures introduction, Example of networks-X.25, Frame Relay & ATM, Protocols and Standards.*

#### **Unit 2: Physical Layer**

**(10)**

*Physical layer-Data rate limits, Transmission media-guided and Unguided, Switching systems-Circuit switching, Datagram Switching & Virtual circuit switching, Structure of circuit and packet switch, cable modem and DSL technologies, SONET basics, selection of IEEE std 802.11 ,a,b,c,g.*

#### **Unit 3: Data link layer**

**(10)**

*Data link layer: Framing, Flow & Error control Protocols, HDLC, PPP, Multiple access techniques-random access, controlled access & Channelization, Ethernet types-bridged, Switched, Full duplex, Fast & gigabit Ethernet, Introduction to Data link layer in 802.11 LAN, Connecting devices like passive hubs, repeaters, Active hubs, Bridges, Two-layer Switches, Routers, three layer switches, Gateway etc., Backbone networks, Virtual LANs, Simple Router architecture, Sliding window protocol.*

**Unit 4: Transport Layer and Network Layer** (10)

**Transport layer**-Process to process delivery, Connection oriented & Connectionless Transport, UDP, TCP, congestion control and Quality of Service.

**Network Layer:** IPv4 address, IPv6 address, Address mapping-ARP, RARP & DHCP, IPv4 datagram detail format, IPv6 datagram detail format, ICMP, IGMP, Network layer issues like Delivery, forwarding, intra-domain and Inter-domain routing, Routing algorithms like Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, Path vector routing etc., Addressing types-Physical, Logical & port address.

**Unit 5: Application Layer** (10)

Application layer protocols and applications like Ping, FTP, telnet, http (www), SMTP, SNMP, Trace route, TFTP, BOOTP, DNS, NFS, RPC, X-server, E-mail, Introduction to streaming Audio/Video,P2P file sharing, Introduction to socket programming.

**Unit 6: Basics of Network Security and Network administration.** (09)

**Network security:** Introduction to Cryptography, Secret key algorithm, public key algorithm, Hash Functions, basic ITU-T Recommendation - X.805 Security Architecture, Basics of Security Requirements/Services/Dimensions, Basics of Security attacks, Basics of Security mechanisms / solutions.

**Network Administration:** UTP Cabling for PC to PC communication, Network tester, network monitoring, Protocol Analyzer, Network Simulation, internet access through Dialup/DSL/Leased Line/Mobile handset.

**Text Books**

1. Behrouz A. Forouzan," Data Communications and Networking", 4th Edition, Tata McGraw Hill
2. Andrew Tenenbaum, "Computer Networks", 4th Edition, Pearson Education.
3. Kurose & Ross, "Computer Networking- A top Down Approach featuring the Internet", 3rd edition, Pearson Education.
4. William Stallings, "computer Networks and Cryptography", 3rd edition, Pearson Education

**Reference Books**

1. Behrouz A. Forouzan, "TCP/IP protocol Suit", 3rd edition, Tata McGraw Hill Publications
2. Stevens,"TCP/IP illustrated Volume - I & II", Pearson education.
3. Feibel Werner, "Encyclopaedia of networking", Pearson education.
4. Frank J. Derfler, "Practical Networking", 2nd edition, QUE international Publishing.
5. Atul Kahate, "Cryptography and Network Security", 2nd edition, TATA McGraw Hill
6. Kenneth Mansfield, "Computer Networking from LANs to WANs: Hardware, software & Security", CENGAGE learning.
7. Nurul Sarkar, "Computer Networking & Hardware concepts", Information Science Publisher, USA.

## **B. E. Eighth Semester**

**(Electronics /Electronics & Communication/ Electronics & Telecommunication Engg)**

### **COMPUTER COMMUNICATION NETWORK**

**Duration: 2 Hrs.**

**College Assessment: 25 Marks**

**University Assessment: 25Marks**

**Subject Code: BEECE802P/ BEETE802P/ BEENE802P**

**[0 – 2 – 0– 2]**

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#### **Objectives:**

The objective of this course is to provide students with understanding of

1. Various physical equipments used for networking
  2. Various types of protocols working on various layers of OSI reference model
  3. Connecting computers in Local Area Network
- 

#### **Outcomes: At the end of the course the student should be able to**

1. understand and select various cables and connectors used for networking
  2. Establish peer to peer computers as well as Local Area Network connectivity
  3. Effectively use available networking tools in Computer Communication Network
- 

**Any EIGHT practicals are to be conducted**

#### **LIST OF EXPERIMENTS**

1. To study network simulator & get familiar with NS2
2. To create network Topology in NS2.
3. To demonstrate data transmission using Ping protocol, tracert, IP configuration & hub.
4. To study the fundamental of socket programming.
5. To understand IP address of the system, dhcp, network address translation.
6. To understand the domain name server.
7. To Study Protocol analyzer.
8. To configure router
9. To Study of FTP ,HTFT protocol.
10. To perform PC to PC communication using RS-232 port.
11. To understand Wireless TCP and UDP protocols
12. To demonstrate Network security cryptography

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**WIRELESS & MOBILE COMMUNICATION**

**Duration: 3 Hr.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE803T/ BEETE803T**

**[4 – 0 – 0 – 4]**

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**Objectives:**

- 1. To impart the fundamental concept of mobile communication system.**
  - 2. To give the student the idea about cellular communication theory & technology**
  - 3. To introduce various technology and protocol involved in mobile communication**
  - 4. To provide the student with an understanding the cellular concept.**
- 

**Outcome: By the end of the course, the students shall be able to:**

- 1. Design a model of cellular system communication and analyze their operation and performance.**
  - 2. Quantify the causes and effects of path loss and signal fading on received signal characteristics.**
  - 3. to construct and analyze the GSM system**
- 

**Unit 1: The cellular concept**

**(06)**

Evolution of mobile radio communication. Cellular telephone system, frequency reuse, channel assignment and handoff strategies, interference and system capacity, trunking and grade of service, improving capacity in cellular system.

**Unit 2:- The mobile radio environment**

**(08)**

Causes of propagation path loss, causes of fading-long and short term, definition of sample average , statistical average, probability distribution, level crossing rate and average duration of fade, delay spread, coherence bandwidth, inter-symbol interference.

**Unit 3:- Equalization, diversity and channel coding**

**(08)**

Fundamentals of equalization, space polarization, frequency and time diversity techniques, space diversity , polarization diversity, frequency and time diversity, fundamentals of channel coding.

**Unit 4:- GSM**

**(08)**

Global system for mobile: services and features, GSM system architecture, GSM radio subsystem, GSM channel type, GSM frame structure, signal processing in GSM, introduction to CDMA digital cellular standard, Third generation wireless networks, 3G technology.

**Unit 5:-Introduction to wireless networking****(08)**

Difference between wireless and fixed telephone networks, development of wireless network, traffic routing in wireless networks.

**Mobile IP and wireless access protocol**, mobile IP, operation of mobile IP, collocated address, Registration, Tunneling, WAP Architecture, overview, WML scripts,WAP service, WAP session protocol.

**Unit 6: Wireless LAN Technology****(07)**

Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE 802 protocol, Architecture, IEEE802 architecture and services, 892.11 medium access control, 802.11 physical layer.

Wireless Application Protocol: architecture, WDP,WTLS, WTP, WSP, WAE,WML scripts.

**TEXT BOOKS:**

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, PHI, 2nd Edn.
2. Wireless Communication and Networking – William Stallings, PHI, 2003.
3. Mobile Communications- Jochen Schiller, Pearson Education, 2004.

**REFERENCES:**

1. Wireless Digital Communications – KamiloFeher, PHI, 1999.
2. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, Pearson Education, 2002.
3. Frouzan, Data communications and Networking, third edition, Tata McGraw-Hill Publication,2004.
4. Mobile Cellular Telecommunications-William C Y Lee, 2 edition, Mc. Graw Hill Publication.

## B. E. Eighth Semester

(Electronics & Communication/ Electronics & Telecommunication Engg)

### Elective 2- WIRELESS SENSOR NETWORK

Duration: 3 Hrs.

College Assessment: 20 Marks

University Assessment: 80 Marks

Subject Code: BEECE804T/ BEETE804T

[ 3 – 0 – 1 – 4]

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#### Objectives:

1. Introduce wireless sensor network architectures and communications protocols provide an understanding of mutual relationships and dependencies between different protocols and architectural decisions by offering an in-depth investigation of relevant protocol mechanisms.
  2. Introduce sensor network platforms, operating systems and programming tools for sensor networks.
  3. Introduce design spaces for sensor networks
  4. Study wireless sensor network solutions with practical implementation examples and case studies.
  5. Introduction to wireless sensor networks: Challenges for WSNs, enabling technologies.
  6. Single node architecture: Hardware components, energy consumption of sensor nodes, operating systems and execution environments.
- 

**Outcome:** By the end of this course, the students shall be able to

1. Demonstrate advanced knowledge and understanding of the engineering principle of sensor design, signal processing, established digital communications techniques, embedded hardware and software, sensor network architecture, sensor networking principles and protocols.
  2. Demonstrate a computing science approach, in terms of software techniques, for wireless sensor networking with emphasis on tiny sensors, sensor specific programming languages, RFID technology, embedded architectures, software program design and associated hardware, data fusion.
  3. Demonstrate knowledge of the associated business, legislative, safety and commercial issues; future technological advances and the way these will impact on the engineering product enterprise process.
- 

#### Unit – I

(08)

Introduction and Overview of Wireless Sensor Networks, Commercial and Scientific Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology, Sensor Taxonomy, wireless network environment, wireless network trends.

#### Unit – II

(08)

Radio technology primer, Available wireless technologies, Wireless Sensors Networks Protocols, Physical Layer, Fundamentals of Medium Access Control Protocols for Wireless Sensor Networks, MAC protocols for WSN, Case Study, IEEE 802.15 4LR WPAN, Standard case study.

#### Unit – III

(08)

Sensors Network Protocols, Data dissemination and gathering, Routing Challenges and design issues in wireless sensor network, Routing strategies in WSN.

**Unit – IV** (08)

Protocols, Transport Control Protocols for Wireless Sensors Networks, Traditional transport control protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP.

**Unit – V** (06)

Middleware for Sensor Networks, WSN middleware principles, Middleware architecture, existing middleware.

**Unit – VI** (07)

Network Management for Wireless Sensor Networks, Requirements, Design issues, Examples of management Architecture, Performance and Traffic Management Issues.

**Text Books:**

1. Morgan Kaufmann F. Zhao and L. Guibas, ' Wireless Sensor Networks', San Francisco, 2004.
2. C. S. Raghavendra, Krishna M. Sivalingam, Taieb F. Znati , 'Wireless sensor networks', Edition: 2, Published by Springer, 2004 ISBN 1402078838, 9781402078835

**Reference Books:**

1. "Wireless Sensor Networks: Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley Interscience Publication, 2007
2. "Computer Networks", Andrew Tanenbaum, 4th ed, Pearson Education, 2007

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**  
**Elective 2- EMBEDDED SYSTEMS**

**Duration: 3 Hrs.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE804T/ BEETE804T**

**[3 – 0 – 1 – 4]**

**Objectives:**

1. To give sufficient background for understanding embedded systems design.
2. To give knowledge of RISC processor.
3. To understand connections of various peripherals with microcontroller based system
4. To study of embedded system design aspects.

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**Outcome: By the end of the course, the students shall be able to**

1. design embedded based system .
  2. design embedded system based on RTOS and communication protocols.
- 

**UNIT I: EMBEDDED SYSTEM INTRODUCTION**

**(08)**

*History, Design challenges, Optimizing design metrics, Time to market, NRE and UNIT cost design metrics, Application of embedded systems and recent trends in embedded systems.*

**UNIT II: EMBEDDED SYSTEM ARCHITECTURE**

**(08)**

*Hardware and software architecture, Processor selection for Embedded System, Memory Architecture and IO devices , Interrupt Service Mechanism ,Context switching, Device Drivers.*

**UNIT III: ARM PROCESSOR**

**(10)**

*Architecture and Programming: RISC and CISC, ARM organization, ARM Programmers model, operating modes, Exception Handling, Nomenclature, Core Extensions, ARM Assembly Language Programming, Introduction to ARM instruction set*

**UNIT IV: PROTOCOLS**

**(06)**

*Bluetooth, IEEE 802.11 and IEEE 802.16, GPRS, MODBUS CAN, I2C and USB*

**UNIT V: REAL TIME OPERATING SYSTEM CONCEPTS**

**(08)**

*Architecture of the kernel , Task scheduler , ISR , Semaphores , Mailbox , Message queues , Pipes, Events , Timers , Memory Management.*

**UNIT VI: CASE STUDY OF EMBEDDED SYSTEM:**

**(05)**

*Based on Communication, Automation, Security, Automobile Fields*

**Text Books:**

- 1) Raj Kamal, "Embedded Systems ", TMH Publications.
- 2) Frank Vahid, "Embedded System Design", Wiley Publications, New edition 2001.
- 3) Sloss endrew & Dominic Symes, "ARM system Developers Guide", Morgan Kaufmann , 2004 .

**Reference Books :**

- 1) Dr. K.V.K.K. Prasad , "Embedded / Real Time Systems", Dreamtech Publications
- 2) Iyer, Gupta , "Embedded Real systems programming", TMH Publications.
- 3) Steve Heath, "Embedded System Design", Neuwans Publications
- 4) Jonathan,W. Valvano, " Embedded Microcomputer System Realtime Interfacing", Cenage Publications,  
3<sup>rd</sup> Edition.

## B. E. Eighth Semester

(Electronics & Communication/ Electronics & Telecommunication Engg)

### Elective 2- DIGITAL IMAGE PROCESSING

**Duration: 3 Hrs.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE804T/ BEETE804T**

**[ 3 – 0 – 1 – 4 ]**

#### **Objectives:**

1. Provide the student with the fundamentals of digital image processing.
2. Introduce the students to some advanced topics in digital image processing.
3. Give the students a useful skill base that would allow them to carry out further study in the field of Image processing.

---

#### **Outcome: By the end of the course, students shall be able to**

1. have an appreciation of the fundamentals of Digital image processing including the topics of filtering, transforms and morphology, and image analysis and compression.
  2. implement basic image processing algorithms in MATLAB.
  3. have the skill base necessary to further explore advanced topics of Digital Image Processing.
  4. make a positive professional contribution in the field of Digital Image Processing
- 

#### **Unit 1: Digital Image Fundamentals**

**(06)**

*Components of Image Processing System. , Image Sensing and Acquisition, Image Sampling & Quantization, Spatial and Gray Level Resolution, Basic Relationships between Pixels. Statistical parameters, Measures and their significance, Mean, standard deviation, variance, SNR, PSNR etc.*

#### **Unit 2: Image Enhancement**

**(10)**

*Enhancement in Spatial Domain: basic gray level transformations, histogram processing, equalization, Arithmetic and logical operations between images, Basics of spatial filtering, smoothening and sharpening spatial filters, Image Enhancement in frequency Domain: smoothening and sharpening frequency domain filters, Fundamental of color image processing: color models, RGB, CMY, YIQ, HIS, Pseudo Color Image processing: Intensity filtering, gray level to color transformation, Basics of full color image processing.*

#### **Unit 3: Image Transforms**

**(08)**

*2D-DFT, FFT, DCT, the KL Transform, Walsh/Hadamard Transform, Haar Transform, slant Transform , Basics of wavelet transform.*

#### **Unit 4: Image Coding and Compression**

**(08)**

*Image Coding Fundamentals, Image Compression Model, fundamentals- redundancy: coding, interpixel, psychovisual, fidelity criteria, Basic compression methods Error Free Compression - variable length, bit plane, LZW arithmetic Lossless Predictive, Lossy Compression- Lossy Predictive. Fundamentals of JPEG, MPEG, fractals.*

#### **Unit 5: Image Analysis**

**(08)**

*Segmentation: Point, line, Hough Transform, Edge detection, Boundary detection and*

*Thresholding, Region Based segmentation.*

*Representation & Description :Boundary representation by chain codes, signature & skeleton Boundary descriptors, shape number, Fourier descriptors ,Basics of Regional descriptor, boundary representation by chain codes and B splines, Hough Transform, Morphological Image Processing: Dilation, Erosion, Opening, Closing on Binary Images.*

**Unit 6: Image restoration and reconstruction**

**(05)**

*Image Degradation Mode, Noise Models, and Restoration in Presence c Noise in spatial Domain. Inverse Filtering, wiener filtering, Introduction to Image reconstruction from projections applications of Image Processing.*

**Text Books**

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education,
2. Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.
3. S Jayaraman, "Digital Image Processing", Tata McGraw Hill Publications.
4. A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education

**Reference Book**

1. Pratt William, "Digital Image Processing", John Wiley & Sons
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thomson Learning, 2001
3. Milan Sonka, Vaclav halvac , "Image Processing analysis & Machine Vision", Cenage Learning

**B. E. Eighth Semester**

**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**Elective 2- ARTIFICIAL INTELLIGENCE**

**Duration: 3 Hr.**

**College Assessment: 20 Marks**

**University Assessment: 80 Marks**

**Subject Code: BEECE804T/ BEETE804T**

**[ 3 – 0 – 1 – 4 ]**

**Objectives:**

1. To introduce the fundamental concepts of artificial intelligence;
2. To equip students with the knowledge and skills in logic programming using Prolog;
3. To explore the different paradigms in knowledge representation and reasoning;
4. To explain the contemporary techniques in machine learning;
5. To evaluate the effectiveness of hybridization of different artificial intelligence techniques.

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**Outcome: By the end of the course students shall be able to:**

1. understand the history, development and various applications of artificial intelligence;
  2. familiarize with propositional and predicate logic and their roles in logic programming;
  3. understand the programming language Prolog and write programs in declarative programming style; .
  4. learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
  5. understand how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic);
  6. master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm;
  7. apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.
- 

**Unit 1: Foundation**

**(08)**

*Intelligent Agents, Agents and environments, Good behavior, The nature of environments, structure of agents, Problem Solving, problem solving agents, example problems, searching for solutions, uniformed search strategies, avoiding repeated states, searching with partial information.*

**Unit 2: Searching**

**(08)**

*Search and exploration, Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP, Structure of problems, Adversarial Search, Games: Optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance.*

**Unit 3: Knowledge Representation****(08)**

*First order logic, representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, Resolution, Knowledge representation, Ontological Engineering, Categories and objects, Actions - Simulation and events, Mental events and mental objects.*

**Unit 4: Learning****(08)**

*Learning from observations: forms of learning, Inductive learning, Learning decision \trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning.*

**Unit 5: Perception and Expert System****(06)**

*Visual perception -Waltz's algorithm, Introduction to Expert System, Architecture and functionality, Example Expert system*

**Unit 6: Natural Language Understanding****(07)**

*Why NL, Formal grammar for a fragment of English, Syntactic analysis, Augmented grammars, Semantic interpretation, Ambiguity and disambiguation, Discourse understanding, Grammar induction, Probabilistic language processing, Probabilistic language models.*

**Text Book**

1. Stuart Russell, Peter Norvig, "Artificial Intelligence, A Modern Approach", 2<sup>nd</sup> Edition, Pearson Education / Prentice Hall of India, 2004.

**Reference Books**

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw- Hill,
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.
4. Eugene charniak, "Introduction to Artificial Intelligence", Pearson Education.
5. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Publications

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**Elective 3- RANDOM SIGNAL THEORY**

**Duration: 3 Hrs.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE805T/ BEETE805T**

**[ 3 – 0 – 1 – 4 ]**

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**Objectives:**

- 1. To Learn the Random Variables and Random Processes**
  - 2. To Design the systems which involves randomness using mathematical analysis and computer simulations.**
- 

**Outcome: At the end of the course, students shall be able to**

- 1. Apply theory of probability in identifying and solving relevant problems.**
  - 2. Define and differentiate random variables and vector through the use of cumulative distribution function (CDF), probability density function (PDF), probability mass function (PMF) as well as joint, marginal and conditional CDF, PDF and PMF.**
  - 3. Show probability and expectation computations using important discrete and continuous random variable types.**
  - 4. Define and specify random processes and determine whether a given process is stationary or wide sense stationary.**
- 

**Unit I: RANDOM VARIABLES**

**(08)**

**Introduction:** *Random input signals, , random experiments and events.*

**Random Variables:** *Concept of random variable, distribution functions, density functions, mean values and moments, density functions related to Gaussian-Rayleigh distribution, Maxwell distribution, Chi-square distribution, normal distribution, uniform distribution, exponential distribution, Conditional probability distribution and density functions.*

**Unit II :**

**(09)**

**Several random variables :** *Two random variables, joint conditional probability, statistical independence, correlation between random variables, density function of sum of two random variables, probability density function of two random variables, the characteristic function.*

**Elements of statistics:** curve fitting and linear regression, correlation between two sets of data.

**Unit III: RANDOM PROCESSES**

(08)

**Random Processes:** Continuous and discrete, deterministic and non-deterministic, stationary and non-stationary, ergodic and non-ergodic.

**Correlation functions :** Introduction, autocorrelation function of a binary process, properties of auto correlation functions, examples of auto-correlation functions, cross-correlation functions, properties of cross correlation functions, examples and applications of cross-correlation functions.

**Unit IV: SPECTRAL DENSITY**

(08)

*Introduction, relation of spectral density to the fourier transform, properties of spectral density, mean square values from spectral density, relation of spectral density to the auto-correlation function, White noise, Cross spectral density, examples and applications of spectral density.*

**Unit V: RESPONSE OF LINEAR SYSTEMS TO RANDOM INPUT**

(06)

*Analysis in the time domain, mean and mean square value of system output auto-correlation function of system output, cross-correlation between input and output, spectral density at the system output.*

**Unit VI: OPTIMUM LINEAR SYSTEMS**

(06)

*Criteria of optimality, restrictions on the optimum system, optimization by parameter adjustment systems that maximizes signal to noise ratio, systems that minimize mean square error.*

**Text Books :**

1. G.R. Cooper and C.D. Mcgillem : Probabilistic Methods of Signal and System Analysis, Third Ed, Oxford University Press.
2. M. Lefebvre : Applied Probability and Statistics, Springer, McMillan India Ltd.
3. A. Papoulis, S.U. Pillai : Probability, Random Variable and Stochastic Process , TMH.
4. Peyton J. Peebles (Jr), "Problems and Solutions in Probability, Random Variables and Random Signal Principles", McGraw Hill Publications.
5. P Ramesh Babu, "Probability Theory and Random Processes", McGraw Hill Publications

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**Elective 3- ROBOTICS & AUTOMATION**

Duration: 3 Hrs.  
College Assessment: 20 Marks  
University Assessment: 80 Marks

**Subject Code: BEECE805T/ BEETE805T**

**[ 3 – 0 – 1 – 4 ]**

**Objectives:**

1. The course has been so designed to give the students an overall view of the mechanical components.
2. The mathematics associated with the same. Actuators and sensors necessary for the functioning of the robot.

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**Outcome:** By the end of the course, the students shall be able to

1. Explore 8051 microcontroller architecture
  2. Effectively utilize instruction set for assembly language programming
  3. Interface different on & off chip peripherals with 8051 using C language
  4. Basics of 8051 can be used for robotic applications
- 

**UNIT1:**

**(10)**

*Definition of a Robot, A brief introduction to Robot Technology, Sensory perception, Intelligence, End Effectors, Sensory feedback, Robot Vision / Computer Vision and its fundamental components, Tactile Sensing, Range finding and real world navigation Speech synthesis and recognition.*

**Robot control fundamentals :** *The Artificial intelligence view point, comparison of human brain and computer in the context of intelligent behavior, problem representation in A.I., system problem solving technique in A.I.*

**UNIT 2:**

**(08)**

*Definition of knowledge, Domain and logic : Elements of logic, propositional calculus, predicate calculus, pros and cons of logic, production system and their basis elements, about Expert system comparison of various methods of knowledge representation.*

**UNIT 3:**

**(08)**

*Elements of speech, Time Domain Analysis / Synthesis of speech and waveform digitization, frequency Domain Analysis / Synthesis of speech phoneme Speech Synthesis, various type of speech recognition Systems and their basics ideas, Isolated word Recognition, Connected Speech understanding.*

**UNIT4:**

**(06)**

*Elements of vision, Image Transformation, Image Analysis, Image Understanding of Machine perception, Industrial Vision System.*

**UNIT 5:****(06)**

*Triangulation Method, Time of Flight (TOF), Ranging Method, Robot Position and Proximity Sensing, Tactile- Sensing System, Sensing Joint Forces and their importance in Robot programming, sensing tough and slip*

**UNIT 6 :****(07)**

*Various Robot Programming Languages and their characteristics, characteristics of Robot Task Level language, comparison of Robot programming language, features of the high level languages used in conventional programming language, featuring with the high level language used in conventional programming.*

**TEXT BOOKS :**

1. Staugard A.C. : "Robotic and AI", Prentice Hall, Engle Wood Cliff N.J. 1987.
2. Lee C.S.G., Fu K. S., Gonzalez R.C. : "Robotic-Control, Sensing and Intelligence", Mc- Graw Hill, Singapore, 1987.

**REFERENCE BOOKS :-**

1. Klafferetal : "Robotics", Prantice Hall Publications
2. Parent M. and Laugreau C. : "Robot Technology (Vol.4 : Logic and Programming", Kogan Page, London, 1985.
3. Aleksander I. ,Farreny H. and Ghallab M. : "Robot Technology" (Vol-1)., Decision and Intelligence "Kogan Page", 1986.
4. S.R. Deb, " Robotics Technology & Flexible Automation", McGraw Hill Publication
5. S.K. shaha, "Introduction to Robotics", McGraw Hill Publication

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**Elective 3- SATELLITE COMMUNICATION**

Duration: 3 Hrs.  
College Assessment: 20 Marks  
University Assessment: 80 Marks

**Subject Code: BEECE805T/ BEETE805T**

**[ 3 – 0 – 1 – 4 ]**

**Objectives:**

1. To learn working principle of satellite communication system.
3. To understand the orbital aspects and components of a satellite communication system.
4. To analyze the link budget of a satellite communication system and study of satellite orbits and launching.
5. To get knowledge and relate different components in satellite communication and use them in projects.

**Outcome:** At the end of the course, the student shall be able to :

1. Do research with capabilities in the design, development and manufacture of satellite communication systems used in a wide spectrum of applications.
2. Experience real world experience from household appliances to sophisticated satellite communication, from electronic ignition to neural networks and signal processing chips & to integrate academic discipline with project-based engineering applications, classroom learning theory
3. Able for Acquisition of technical competence in specialized areas of Satellite Communication engineering.
4. Able to identify, formulate and model problems and find Satellite Communication engineering solutions based on a system approach.

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**UNIT I:**

**(08)**

Introduction: Origin of Satellite communication, Current state of satellite communication. Orbital aspect of satellite communication: Orbital mechanism, equation of orbit, locating satellite in orbit, orbital elements, and orbital perturbation. Space craft subsystem: Attitude and orbit control system, Telemetry tracking and command power system, and communication subsystem.

**UNIT II:**

**(08)**

Satellite link design: System noise temperature and T / T ratio, down link design, domestic satellite system, uplink design, design of satellite link for specified (C / N).

**UNIT III:**

**(08)**

Multiple access techniques: FDMA, FDM / FM / FDMA, effects of intermodulation, compounded FDM / FM / FDMA, TDMA, TDMA frame structure and design, TDMA synchronization and timing, code division multiple access, SS transmission and reception; Applicability of CDMA to commercial system, multiple access on board processing SCPS system, digital speech interpolation system, DAMA.

**UNIT IV:****(08)**

Propagation on satellite: Earth's path – propagation effects, atmospheric absorption, Scintillation effects, Land and Sea multipath, Rain and ice effects, Rain drop distribution, calculation of attenuation. Rain effects on Antenna noise temperature.

**UNIT V:****(08)**

Encoding and forward error correction: Error detection and correction, channel capacity, error detecting codes, linear block codes, error correction with linear block codes, performance of block error correction codes, convolution codes, cyclic codes, BCH and codes, error detection on satellite links.

**UNIT VI:****(05)**

Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors affecting orbit utilization, tracking, equipment for earth station.

**Text BOOKS:**

1. "Satellite Communication" by T. Pratt. Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2003.
- 2." Satellite Communication", D. C. Agrawal, Khanna Publishers
3. "Satellite Communication", Dennis Roddy , 4th Edition, McGraw- Hill International edition, 2006.
4. "Satellite Communication", T. T. Hai., Mc.Graw Hill Publications

**REFERENCES BOOKS:**

1. **Satellite Communication Systems Engineering**, W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.
2. Satellite Communication, Mark R Chartrand, Cenage Learning

**B. E. Eighth Semester**  
**(Electronics & Communication/ Electronics & Telecommunication Engg)**

**Elective 3- CMOS VLSI DESIGN**

**Duration: 3 Hrs.**  
**College Assessment: 20 Marks**  
**University Assessment: 80 Marks**

**Subject Code: BEECE805T/ BEETE805T**

**[ 3 – 0 – 1 – 4 ]**

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**Objectives:**

1. Motivating students to learn basics of CMOS VLSI design.
  2. To learn CMOS device parameters and characteristics.
  3. To detect faults and errors in the design.
  4. To learn physical design of logic gates.
  5. To Study CMOS processing technology.
- 

**Outcome: By the end of course, the students shall be able to**

1. Design PMOS and NMOS transistor.
  2. Implementation different combinational logic circuits.
  3. Design layout for various circuits.
  4. Design CMOS transistor.
  5. Experiment on CMOS logic design.
  6. Detect and correct errors in VLSI Design.
- 

**UNIT 1: MOS TRANSISTORS** **(08)**

nMOS enhancement and pMOS enhancement transistor, threshold voltage, body effect, MOS effect, MOS device equations, small signal model for MOS transistor.

**UNIT 2: CMOS INVERTER** **(08)**

Principle of operation, dc characteristics, transient characteristics,  $\beta/\beta_{sat}$ , noise margin, static load MOS inverter, transmission gate, introduction to Bi-CMOS inverter.

**UNIT 3: STUDY OF CMOS LOGIC** **(08)**

Study of combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology.

**UNIT 4: CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION** **(06)**

Resistance and capacitance estimation, switching characteristics, power dissipation, charge sharing.

**UNIT 5: VLSI DESIGN** **(06)**

VLSI processing integration, layout design rules, and stick diagram representation latch up, CMOS circuits and logic design: transistor sizing, fan-in, fan-out and physical design of simple logic gates, CMOS logic structures and clocking strategies.

## **UNIT 6: DESIGN FAULTS**

**(09)**

Types of fault, stuck open, short, stuck at 1, 0 faults, Fault coverage, Need of Design for Testability (DFT), Controllability, predictability, testability, Built In Self Test (BIST), Partial and full scan check, Need of boundary scan check, JTAG, Test Access Port (TAP) controller.

### **Text Books:**

1. "Principal of CMOS VLSI design", Neil H. E. Weste, K. Eshraghian, Addison Wesley VLSI Series.
2. "Digital Interrogated circuits, A Design Perspective" , J. M. Rabaey, A. Chandrakasan, and B. Nikolic., PHI Publications .
3. "CMOS VLSI Design" , Pucknell & K. Eshraghain, PHI Publications

### **REFERENCES BOOKS:**

1. "VLSI Technology", S.M. Sze, McGraw Hill Publications
2. "VLSI Design Technologies for Analog & Digital Circuits", Randall L Gei , McGraw Hill Publications

|      |                           |   |
|------|---------------------------|---|
|      |                           | 2. Solar PV Systems   |
|      |                           | 3. Organizational behavior  |
|      | Professional Elective-I   | 1. Electrical Machine – II<br>2. Power Station Practice<br>3. Electrical Power Utilization  |
| VI   | Open Elective-II          | 1. Testing and maintenance of Electrical Equipments<br>2. Advance Instrumentation<br>3. Optimization Technique  |
|      | Professional Elective-II  | 1. Electrical Installation and Design<br>2. Electrical Machine Design<br>3. Electric Drives and their control   |
| VII  | Open Elective-III         | 1. Energy Management and Audit<br>2. Industrial Economics and Entrepreneurship<br>3. Electric and Hybrid Vehicles   |
|      | Professional Elective-III | 1. Advanced Power Electronics<br>2. HV Engineering<br>3. Integrated Renewable Energy Systems  |
|      | Professional Elective-IV  | 1. Fuzzy Logic and Neural Networks<br>2. Advanced Electrical Power Systems<br>3. Flexible AC Transmission System  |
|      | Professional Elective-V   | 1. Introduction to Artificial Intelligence<br>2. Digital signal processing and its applications<br>3. Introduction to Smart Grid  |
| VIII | Professional Elective-VI  | 1. SWAYAM – <a href="https://swayam.gov.in">https://swayam.gov.in</a><br>NPTEL – <a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a><br>2. MOOC – <a href="https://mooc.org">https://mooc.org</a><br>3. Power semiconductor drives<br>4. Electrical Distribution System |
|      | Professional Elective-VII | 1. SWAYAM – <a href="https://swayam.gov.in">https://swayam.gov.in</a><br>2. NPTEL – <a href="https://onlinecourses.nptel.ac.in/">https://onlinecourses.nptel.ac.in/</a><br>3. MOOC – <a href="https://mooc.org">https://mooc.org</a><br>4. EHVAC/DC transmission System<br>5. Power Quality             |

**III Semester B.E. (Electrical Engineering)**  
**ELECTRICAL ENGINEERING MATHEMATICS (Credits-04)**

|                           |                        |                            |              |           |
|---------------------------|------------------------|----------------------------|--------------|-----------|
| <b>Teaching Scheme</b>    | Theory-03              | Tutorial-01                | Practical-00 | Total-04  |
| <b>Examination Scheme</b> | Internal Assessment-30 | End Semester Assessment-70 |              | Total-100 |

**Learning Objectives:** Students will be able to –

- apply the various methods for the solution to partial differential equations
- analyze the systems with complex variables
- explore the basics of various transformation methods
- apply the mathematical analysis to electrical circuits and systems
- mathematical modeling and probability

**Course Outcomes:**

| <b>UNIT</b> | <b>COS</b> | <b>Learning Outcomes</b>  |
|-------------|------------|---|
| <b>I</b>    | <b>CO1</b> | Solution of Partial Differential Equations of First Order First Degree, Numerical Solution to Ordinary differential equations   |
| <b>II</b>   | <b>CO2</b> | Formulation and solving the systems with complex variables  |
| <b>III</b>  | <b>CO3</b> | Understanding the basics of various Transforms and converting the functions into required transforms, Laplace Transforms analysis and its application to solve differential equations |
| <b>IV</b>   | <b>CO4</b> | Application of Differential equations and Laplace Transform for mathematical model formulation of the physical systems, Understanding the concept of transfer function                |
| <b>V</b>    | <b>CO5</b> | Understanding the concepts of Stochastic analysis and its application   |

**UNIT – I: PARTIAL DIFFERENTIAL EQUATIONS (08Hrs)**

Partial Differential Equations of First Order First Degree i.e. Lagrange's form, Linear Homogeneous Equations of higher order with constant coefficients. Method of separations of variables, Numerical solution of ordinary differential equations :Taylor's series method, Runge-Kutta 4th order method, Euler's modified method. Milne, s Predictor- Corrector method, Solution of Second Order Differential Equations and Simultaneous Differential Equations by Runge- Kutta method.

## **UNIT- II: FUNCTIONS OF COMPLEX VARIABLE (09Hrs)**

Analytic function, Cauchy- Riemann Conditions, Harmonic Functions (excluding orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and Singularities of Analytic function, Residue Theorem (Statement only), Contour integration (Evaluation of real definite integral around unit circle and semi-circle).

## **UNIT –III: Introduction to Transformation Methods (10Hrs)**

Introduction to various transform methods, Definition and fundamentals of Laplace Transforms Simple Applications of Laplace Transform to solve Partial Differential Equations (One dimensional only). Laplace transform of step, ramp & parabolic signals, Time response of first order systems and second order systems for unit step input, Concept of characteristic equation  $q(s) = 0$  vs time response, Introduction to Fourier and z-Transform,

## **UNIT–IV : MATHEMATICAL MODELING AND TRANSFER FUNCTION (08Hrs)**

Mathematical Modeling of physical systems and Differential equations (Mechanical systems, basic translational and rotational systems, basic R-L-C series and parallel circuits), Concept of transfer function, Transfer function for elementary R-L-C circuits, Elementary block diagram single input single output closed loop system and its reduction.

## **UNIT – V: THEORY OF PROBABILITY (07Hrs)**

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Mathematical Expectation, Functions of random variable, Variance & Standard Deviation, Moments, Moment generating function, Measures of central tendency and Dispersion, Skewness and Kurtosis. Binomial distribution, Poisson distribution, Normal distribution.

### **Text Books:**

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
2. A Text Book of applied Mathematics, Volume II , by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
3. Mathematics for Engineers by Chandrika Prasad
4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.
5. Theory & Problems of Probability and Statistics by Murray R. Spiegel , Schaum Series, McGraw Hills

### **Reference Books:**

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
2. Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville

4. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.
5. Control Systems Engineering by Nagrath & Gopal, New Age International Publishers

**III Semester B.E. (Electrical Engineering)**

**NETWORK ANALYSIS**

**Total Credit- 04**

**Subject Code:-BEEE3O2T**

**Teaching Scheme**

Theory-03 Hours/Week

Tutorial/ Activity -01 Hours/Week

Practical:- 02 Hours/ Week

**Examination Scheme**

Th (U)= 70 Th(I)=30

Duration of University Exam:- 3 Hours

**Course Objectives**

Students will be able to –

- To provide various methods of analysis of electric networks under transient and steady state conditions.
- To provide concrete foundation needed to learn future professional courses.

**Course Outcomes:**

**After studying the course, the students will be able to demonstrate the ability to**

**CO1.** Apply mesh current and node voltage methods to analyze electrical circuits.

**CO2.** Apply network theorems for the analysis of networks.

**CO3.** Obtain transient and steady-state responses of electrical circuits.

**CO4.** Synthesize waveforms and apply Laplace transforms to analyze networks.

**CO5.** Evaluate different Network Functions and understand two port network behavior

**Unit –I: Sources, Mesh Analysis, Node voltage analysis (07 Hrs)**

Voltage and Current sources, source transformation, mesh basis equilibrium approach for simple networks of having mutual coupling, Node voltage analysis of networks, concept of duality.

**Unit –II: Network Theorems (07 Hrs)**

Thevenin's, Norton's, Maximum Power transfer, Reciprocity theorems as applied to D C. & A. C. circuits with independent and dependent sources.

**Unit –III: Solution of First and Second Order Networks (07 Hrs)**

Solution of first and second order differential equations of different combinations of series and parallel RLC networks. Initial and final conditions in network elements, free and forced response, time constants.

**Unit –IV: Electric Circuit Analysis using Laplace Transforms (07 Hrs)**

Review of Laplace transform, waveform synthesis, Analysis of electrical circuits using Laplace transform for standard inputs, analysis of networks with and without initial conditions using Laplace transforms.

**Unit –V: Two port networks and Network functions** **(08 Hrs)**

Two port networks, relationship between two port variables, driving point and transfer functions, properties, concept of complex frequency, Poles and zeros.

**Two port network parameters:** Impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnection of two port networks.

**Text Books:**

1. Van Valkenburg, “Network Analysis”, Third Edition, 2009, Prentice Hall of India
2. Sudhakar, A, Shyam Mohan, “Circuits and Networks”, Third Edition, 2006, Tata McGraw-Hill.
3. D. Roy Choudhary, “Networks and Systems”, New Age International Publishers, 2<sup>nd</sup> Edition, 2012
4. Kelkar and Pandit, “Linear Network Theory”, Pratibha Publications.

**Reference Books:**

1. Mahmood Nahvi, Joseph A Edminister, “Schaum’s outline of Electric Circuits”, 6<sup>th</sup> Edition, Tata McGraw-Hill, 6<sup>th</sup> Edition, 2013
2. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
3. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
4. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.
5. K. Sureshkumar, “Electric Circuits & Network”, Pearson Publication
6. Del Toro, “Electrical circuit”, Prentice Hall

**III Semester B.E. (Electrical Engineering)**  
**NETWORK ANALYSIS (Practical)**  
**Total Credit- 01**  
**Subject Code:-BEEE3O2P**

**Teaching Scheme**  
Practical:- 02 Hours/ Week

**Examination Scheme**  
Pr (U)= 25Pr(I)=25

**Course Objectives**

Students will be able to –

- To choose appropriate measuring instruments along with proper rating of wires to carry out various experiments
- To provide hands on experience of substantiating and verifying the theoretical concepts studied in Network Analysis.

**Hands on Experiments related to the course contents of Network Analysis  
(minimum 10 experiments).**

**III Semester B.E. (Electrical Engineering)**  
**ELECTRICAL MEASUREMENT AND INSTRUMENTATION**  
**Total Credit- 04**  
**Subject Code:-BEEE3O3T**

**Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -01 Hours/Week  
Practical:- 02 Hours/ Week

**Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:- 3 Hours

**Course Objectives**

Students will be able to –

- Understand the characteristics and operation of different electrical instrument used for measurement of electrical and non-electrical parameters
- Measurement of active and passive components of electrical circuit using various bridges and transducers.

**Course Outcomes:**

**After studying the course, the students have understood:**

- CO1.** Various aspects of measurement and instrumentation.
- CO2.** Different active and passive components measurement methods.
- CO3.** Power and Energy measurement.
- CO4.** Instrument Transformers.
- CO5.** Aspects and types of transducers.

**Unit I: Generalized Measuring Instruments:** **(08Hrs.)**

Classification of Instruments, forces acting in Indicating instruments, Moving iron, PMMC type instruments, Static and Dynamic characteristics and performance of instruments, Errors in measurements, loading effect of instruments.

**Unit II: Measurement of RLC Elements** **(08Hrs.)**

Measurement of Resistance: classification, Measurement of medium resistance :- Wheatstone Bridge. Low resistance: - Kelvin's Double Bridge. High resistance:- Ohm meter, Megger & loss of charge method.

Measurement of inductance using Maxwell's inductance-capacitance bridge, Measurement of Capacitance using Schering bridge.

**Unit III: Measurement of Power and Energy** **(08Hrs.)**

True RMS Measurement, Blondel's Theorem, Measurement of active, reactive and apparent power in polyphase circuits. Electrodynamometer type wattmeter, Measurement of Energy in single and polyphase circuits, Induction type Energy meter, digital energy meters.

Special Instruments: Power factor meter, frequency meter, synchronoscope

**Unit IV: Instrument Transformers****(08Hrs.)**

General theory of Instrument transformers, various ratios, burden, characteristics and Phasor diagram of Current transformer and potential transformers & extension of range using C.T. & P.T., errors in instrument transformers.

**Unit V: ( Part A) Analog Transducer****(06Hrs.)**

Classification of Transducer, Measurement of Electric quantities through Resistive, inductive, capacitive effects, Measurement of Non-electric quantities like Displacement, pressure, Torque, Flow.

Special Instruments: load cell, seismic instruments, Anemometer, Pyrometer.

**(Part B) Digital Measuring Instruments****(06 Hrs.)**

Definition of Digital transducer, Classification, Introduction to digital measurement, Measurement of Electric quantities like Digital Encoder, Hall effect sensor, Latest trends of measurement in power sector like SCADA, EMS.

**Text Books:**

1. A.K. Sawhney, "A Course in Electrical & Electronics Measurement and Instrumentation", Dhanpat Rai & Sons, 2015
2. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.H. Wheeler & Co. India.
3. C.S. Rangan, G.R. Sharma, V.A.V. Mani, "Instrumentation, Devices and Systems", TMH, 2nd edition

**Reference Books:**

1. Ernest O.Doebelin, "Measurement Systems Application and Design, International Student Edition", McGraw Hill Book Company, 1998.
2. Alan S. Morris, Reza Langari, "Measurement and Instrumentation: Theory and application", Academic Press, 2012
3. Rajendra Prashad, "Electrical Measurement &Measuring Instrument" Khanna Publisher.
4. J.B. Gupta, "Electrical Measurements and Measuring Instruments", S.K. Kataria & Sons
5. H.S. Kalsi, "Electronic Instrumentation", 6th Edition McGraw Hill
6. W.D. Cooper, "Electronic Instrument & Measurement Technique" Prentice Hall International.
7. Dr. V. Kamaraju "Electrical Power Distribution System" McGraw Hill Education (1 July 2017)

**III Semester B.E. (Electrical Engineering)**  
**ELECTRICAL MEASUREMENT AND INSTRUMENTATION**  
**Total Credit- 01**  
**Subject Code:-BEEE3O3P**

**Teaching Scheme**

Practical:- 02 Hours/ Week

**Examination Scheme**

Pr (U)= 25Pr(I)=25

**List of Experiments:(Any 10)**

1. Measurement of low resistance by Kelvin's Double Bridge.
2. Measurement of medium resistance by Ammeter Voltmeter Method.
3. Measurement of high resistance by Loss of Charge Method.
4. Measurement of Capacitance by schering bridge.
5. Measurement of inductance by Maxwell's bridge.
6. Measurement of three phase power by Two Wattmeter method.
7. Study of Differential and Additive connection of current transformer.
8. Reactive power measurement by one wattmeter method.
9. Calibration of energy meter.
10. Study of Differential and Additive connection of current transformer.
11. Measurement of energy using different CTs and PTs.
12. Determination of polarities and ratio of various CTs and PTs.
13. To study and plot the characteristics of LVDT.
14. To study and plot the characteristics of Stain gauge.
15. To analyse the characteristics of the Piezo electric sensor.
16. Study the performance and characteristics of Hall Effect voltage sensor.

**Activity:**

1. To assemble the components of a given electrical circuit. (Resistor, ammeter, voltmeter , battery, one way key, rheostat, connecting wires).
2. To measure the resistance and impedance of an inductor with or without iron core.
3. To measure resistance, voltage (dc/ac), current (dc) and check continuity of a given circuit using a multimeter.
4. To assemble a household circuit comprising of three bulbs, three (on/off) switches, a fuse and a power source.
5. To study the variation in potential drop with length of a wire for a steady current.
6. Measurement of Earth Resistance.
7. Calculation of residential and commercial energy bill.

**III Semester B.E. (Electrical Engineering)**  
**ANALOG DEVICES AND CIRCUITS**

**Total Credit- 04**  
**Subject Code:-BEEE3O4T**

**Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -01 Hours/Week  
Practical:- 02 Hours/ Week

**Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:- 3 Hours

**Course Objectives**

Students will be able to –

- To provide basic knowledge and applications of diodes, transistors and MOSFETs.
- To provide basic functioning of OP-AMPS and applications of OP-AMPS.

**Course Outcomes:**

**After studying the course, the students will be able to demonstrate the ability to**

- CO1.** Design and Analyze rectifier circuits  
**CO2.** Understand the characteristics and use of a transistor as amplifiers  
**CO3.** Apply the knowledge of transistor for the analysis of power amplifiers and oscillators.  
**CO4.** Understand OP-AMPS.  
**CO5.** Analyze and utilize OP-AMPS

**Unit I: Diode Circuits:** **(07 Hrs.)**

P-N junction diode, operation and characteristics; half-wave and full-wave rectifiers, Filters, Ripple factor, characteristics and applications of Zener diodes, photo diodes, LED, Schottkey Diodes, voltage regulators

**Unit II: Transistor Circuits** **(08 Hrs.)**

Operation and characteristics of a BJT. BJT as a switch. BJT as an amplifier: Biasing circuits, small-signal analysis of CE, CB and CC amplifiers, high-frequency analysis. Power Transistors, Transistor as a switch. Field effect transistors and MOSFETs- Principle of operation and characteristics, biasing arrangements

**Unit III: Power amplifiers** **(08 Hrs.)**

Classification as A, B, AB, C, Push pull amplifiers, Cross over distortion, Positive and Negative amplifiers- classification, feedback amplifiers, advantages and applications

**Oscillators-** Barkhausen's criterion, RC and Crystal oscillators

**Unit IV: Power amplifiers** **(08 Hrs.)**

Differential amplifier circuits and their stages, current source, biasing, level Shifting techniques, Common mode and differential mode gain, Impedance of different stages.

**Unit V: Applications of Op-Amp** **(08 Hrs.)**  
Inverting and non-inverting amplifier, integrator, active filter, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion. Hysteresis Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier.

Study of linear ICs: LM741, LM555, LM 7805

**Text books:**

1. Millman and Halkias, "Electronic Devices and Circuits", McGraw Hill.
2. Millman and Halkias, "Integrated Electronics", McGraw Hill
3. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
4. R. Gaikwad, "Operational Amplifiers and applications"
5. Linear ICs Manual I, II, III, National Semiconductors

**Reference Books:**

1. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
2. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
3. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

**III Semester B.E. (Electrical Engineering)  
ANALOG DEVICES AND CIRCUITS**

**Total Credit- 01**

**Subject Code:-BEEE3O4P**

**Teaching Scheme**

Practical:- 02 Hours/ Week

**Examination Scheme**

Pr (U)= 25 Pr(I)=25

10 Experiments based on above syllabus.

### **III Semester B.E. (Electrical Engineering)**

### **RENEWABLE ENERGY STUDIES**

**Total Credit- 03**

**Subject Code:-BEEE3O5T**

#### **Teaching Scheme**

Theory-03 Hours/Week

Tutorial/ Activity -0

Practical:-

#### **Examination Scheme**

Th (U)= 70 Th(I)=30

Duration of University Exam:- 3 Hours

#### **Course Objectives**

Students will be able to –

- Demonstrate understanding of the different types of renewable energy technologies that are currently available, and how they are used to provide energy.
- Identify strengths and limitations associated with the different renewable energy technologies.
- Identify the current major uses of energy (i.e., in agriculture, manufacturing, residential, etc.).

#### **Course Outcomes:**

**After studying the course, the students will be able to demonstrate the ability to**

- CO1.** Memorize the fundamental of solar radiation geometry
- CO2.** Identify and analyse the process of power generation through solar photovoltaic
- CO3.** Highlighting the various applications of Solar Energy.
- CO4.** Outline the site requirement criteria for wind farm & compare different types of wind generators.
- CO5.** Identifying non-conventional Energy sources such as Geothermal, MHD, Biomass, Fuel cell, Tidal, Ocean for generating Electricity.

#### **Unit I- Solar Radiation & its Measurement**

**(06 Hrs)**

Solar Radiation & its Measurement: Solar Constant, Solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surfaces.

#### **Unit 2 – Solar Photovoltaic power generation**

**(10 Hrs)**

Solar Photovoltaic power generation: Physics of solar cells, Characteristic of solar cell, series and parallel connection, types of solar cell, module manufacturing, partial shading, bypass and blocking diode, load calculation, different panel calculations and selection (Monocrystalline, Polycrystalline etc), Calculation of Solar rooftop setup (rating): stand alone PV system with battery and grid connected PV system with Net Metering, Introduction to MPPT.

### **Unit-3 Application of Solar Energy**

**(07 Hrs)**

Application of Solar Energy: Solar water heating, space heating, space cooling, solar thermal heat conversion, Solar Cooking, Solar pumping, Solar Water pumping for agriculture purposes, Calculation of solar setup required in solar water pumping, Solar Green Houses, Hydrogen production from Solar Energy.

### **Unit – 4 Wind Energy**

**(10 Hrs)**

Basic principles of wind energy conversion, wind energy conversion system, wind data & energy estimation, site selection consideration, basic components of wind energy conversion system (WECS), classification of WEC system, generating system, energy storage, application of wind energy. Stand-Alone and Grid Connected Wind-Electrical Power System

### **Unit- 5 Other Nonconventional Energy Source**

**(07 Hrs)**

Brief Introduction to operating principles only: Small scale hydro electric power generation, Energy from Bio –Mass, Geothermal Energy, MHD power generation, Fuel cell, Energy from Ocean, Ocean thermal electric conversion (OTEC), Claude & Anderson cycles, Hybrid cycle, Energy from Tides ,Estimation of Energy & Power in simple single basin ,Tidal system

#### **Text Books:**

1. Non Conventional Energy Sources G.D. Rai, Khanna publishers
2. Non Conventional Energy Resources B. H. Khan 2nd , The McGraw Hill Companies
3. Solar Energy: Principles of thermal collection and storage, S. P. Sukhatme 2nd edition, Tata McGraw Hill Publishing Company Ltd.
4. Solar Photovoltaics: Fundamental, Technologies and Applications, Chetan Singh Solanki , 3<sup>rd</sup> Edition, PHI Learning Pvt. Ltd.
5. Non-Conventional Energy Sources and Utilization, R.K. Rajput, S. Chand Publications.
6. Non-Conventional Energy Resources, D S Chauhan, S K Srivastava, New Age International Publishers

#### **Reference Books:**

1. Fundamentals of Renewable Energy Processes, Aldo Vieira da Rosa, Juan Carlos Ordóñez, Fourth Edition, Elsevier Academic Press
2. Wind and Solar Power Systems: Design, Analysis, and Operation, Mukund R. Patel and Omid Beik, THIRD EDITION CRC PRESS( TAYLOR & FRANCIS)
3. Renewable & Efficient Electric Power Systems, Gilbert Masters John,, Wiley and son's publications.
4. Solar Energy , Robert Foster, Majid Ghassemi and Alma Cota, CRC Press
5. Renewable Energy Systems, David M. Buchla, Thomas E. Kissell, Thomas L Floyd, 1st edition, Pearson Publication
6. Ocean Energy: Tide and Tidal Power, R. H. Charlier, Charles W. Finkl, SPRINGER

#### **Reference Links:**

- <http://www.nptel.iitm.ac.in/>
- [www.ocw.mit.edu](http://www.ocw.mit.edu)

**III Semester B.E. (Electrical Engineering)**  
**INTRODUCTION TO PYTHON PROGRAMMING**

**Total Credit- 01**  
**Subject Code:-BEEE3O6T**

**Teaching Scheme**

Theory-01 Hours/Week  
Tutorial/ Activity -  
Practical:- 02 Hours/ Week

**Examination Scheme**

Th (U)= 35 Th(I)=15  
Duration of University Exam:- 2 Hours

**Course Objectives**

Students will be able to –

- To understand why Python is a useful scripting language for developers
- To learn how to design and program Python applications
- To learn how to use lists, tuples, and dictionaries in Python programs
- To learn how to identify Python object types.

**Course Outcomes:**

**After studying the course, the students will be able to**

- CO1.** Identify different operators and execute different programs using loops  
**CO2.** Analyse Strings, List, Tuples, Dictionary and Sets  
**CO3.** Illustrate functions and utilise Date Time in programming language.

**Unit I : Introduction To Python** **(04 Hrs.)**  
Introduction To Python, Operators, Identifiers, Variables, Relational Operators, User Input And Output

**Unit II: Data Types Of Python** **(05 Hrs.)**  
Strings – Indexing, Slicing, Methods For Strings – Isupper, Upper, Lower, Find, Swapcase Etc, List – Indexing, Slicing, Copy (Deep And Shallow), Methods For List – len, append, extend, sort ,insert, delete, pop, max, min, sum, count etc, List Comprehensions, TUPLES – discard, remove and pop, DICTIONARY – creation method, lists of tuple in dictionary, list of list in dictionary, len and del in dictionary, Deep and shallow copy in dictionary, Methods for dictionary, dictionary comprehension, SETS

**Unit III : Functions, Loops And Modules** **(05 Hrs.)**  
Control Statement - Conditional Statement Like If, Else, Elif , Loop- While, For, Loop Control Statement - Break, Continue, Pass, Introduction To Functions, Logic With Python Functions, Keyword Arguments, Args And Kwargs, Return Statement, Lambda, Map And Filter, Import Module , Datetime With Python And Exception Handling  
Time Class, Date Time Class, Date From Time Stamp, Time Delta, String Format Time, String Past Time, Handling Timezone In Python, Exception Handling- Try, Except, Finally

## **Text Books**

1. Programming And Problem Solving With Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill
2. Let Us Python, Yashwant Kanetkar and Aditya Kanetkar, 2nd Edition, bpb Press
3. Python Crash Course, 2Nd Edition: A Hands-On, Project-Based Introduction To Programming, Eric Matthes (No Starch Press, 2016)
4. Zero To Mastery In Python Programming, Best Python Book For Beginners, by RAKESH K. YADAV , SRINIVAS ARUKONDA, MONU SINGH, VEI Publishers
5. Core Python Programming - Covers Fundamentals to Advanced Topics Like OOPS, Exceptions, Data Structures, Files, Threads, Networking, GUI, DB Connectivity and Data Science Second, Rao R. Nageswara, Dreamtech Press
6. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford Higher Education

## **Reference Book**

1. Mark Lutz, Programming Python, O'Reilly, 4th Edition, 2010
2. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
3. Head First Python 2e: A Brain-Friendly Guide By Paul Barry, Oreilly Publication

**III Semester B.E. (Electrical Engineering)**  
**INTRODUCTION TO PYTHON PROGRAMMING**  
**Total Credit- 01**  
**Subject Code:-BEEE3O6P**

**Teaching Scheme**

Practical:- 02 Hours/ Week

**Examination Scheme**

Pr(U)= 25Pr(I)=15

**List of Practical's (Minimum 10 experiments should be performed)**

1. Print only the words that starts with letter 's' in the following statement –
2. St- 'print only the word that starts with s in this sentence'
3. Print Every word from the below sentence which has even number of letters –
4. St- 'print only the word that starts with s in this sentence'
5. write a program that prints the integer from 1 to 100, but for multiples of 3 print 'FIZZ' instead of number and for multiples of five print 'BUZZ'. For numbers which are multiples of both 3 and 5 print 'FIZZBUZZ'
6. Write a program using function to check who is employee of the month.
7. Write a program to mimic the carnival game 'Three Cup Montee'
8. write a program that returns the lesser of two given numbers if both numbers are even, but returns the greater if one or both numbers are odd.
9. Write a python function that accepts a string and calculate the number of upper case letters and lower case letters.
10. Write a python function that takes a list and return anew list with unique elements of the first list. For example,
11. Sample List =[1,1,1,2,2,3,3,4]
12. Unique List =[1,2,3,4]
13. Write a python function to multiply all the numbers in the list
14. Write a program for validating the user input
15. Using Object oriented Programming, write a program for opening a Bank account, deposit of money and withdrawal of money. Also generate a 4 digit unique code for each transaction.
16. Write a program to print next 5 days starting from today
17. Write a function that asks for an integer and prints square of it. Use a while loop with a try, except, else block to account for incorrect inputs.

### **III Semester B.E. (Electrical Engineering)**

### **ENVIRONMENTAL STUDIES**

**Non – credit (Audit)**

**Subject Code:- BEEE307T**

#### **Teaching Scheme**

#### **level**

Theory – 01 Hours/Week

Tutorial/Activity – 1 Hours/Week

#### **Examination Scheme : At college**

Th (C) = 35, Th (I) = 15

Duration of college Exam: 2 Hours

#### **Unit- I Air pollution and its control techniques:**

**[06 Hours]**

Contaminant behavior in the environment, air pollution due to Sox, NOx, photochemical smog. Indoor air pollution Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle. Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control air pollution, ambient air quality and continuous air quality monitoring, control measures at source, Kyoto Protocol, Carbon Credits.

#### **Unit – II Water pollution and its control techniques:**

**[06 Hours]**

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, micro plastics.

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal and its utility.

Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills.

#### **Unit –III other Environmental Pollution & Waste Management:**

**[06 Hours]**

**Soil pollution:** Soil around us. Soil water characteristics, soil pollution. Causes, effects & control : noise pollution, nuclear & radiation hazards, marine pollution (Oil spills & Ocean Acidification)

**Solid waste management:** Composting, vermiculture, landfills, hazardous waste treatment.

**Bioremediation technologies,** conventional techniques (land farming, constructed wetlands), and **Phytoremediation.**

**Degradation of xenobiotics in environment:** Petroleum hydrocarbons, pesticides, heavy metals introduction, types of e-wastes, environmental impact, e-waste recycling. e-waste recycling, e-waste management rules .

## **Unit-IV Social Issues and the Environmental Laws [06]**

### **Hours]**

Concept of Sustainable development water conservation. Rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental Laws (brief idea only) Environment Protection Act, air (Prevention and Control of Pollution) Act, water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act Issues involved in enforcement of environmental legislation. Different government initiatives (brief idea only)- National ambient air quality standard 2009, Swachh Bharat Abhiyan, National afforestation program and Act- 2016, National River conservation plan and National Ganga River basin authority, Formation of National Green Tribunal.

### **Activity**

1. Field Trip & Report Writing
2. Case-study & Report Writing

### **Reference Books:**

1. Benny Joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited
2. B.K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut

3. P Aarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth-Heinemann
4. D.D. Mishra, S.S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & company Ltd.
5. Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6. Indian Environmental Law: Key concepts and Principles edited by Shibani Ghosh, Publisher, Orient BlackSwan, 2019. ISBN, 9352875796.
7. P. Thangavel & Sridevi, Environmental Sustainability: Role of Green technologies, Springer publications.

**IV Semester B.E. (Electrical Engineering)**

**SIGNAL AND SYSTEMS**

**Total Credit- 04**

**Subject Code:- BEEE401T**

**Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -01 Hous/Week

**Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:-3 Hours

**Course Objectives**

Students will be able to –

- Understand the various methods of analysis for continuous time and discrete time systems in time domain and frequency domain
- Apply various transformation analysis to electrical signals

**Course Outcomes:**

**After studying the course, the students will be able to**

- CO1.** Understanding the basics of signal space theory  
**CO2.** Understanding the concepts of state space representation  
**CO3.** Understand convolution sum of two signals  
**CO4.** Apply Fourier and Laplace transforms, understand the duality Apply DFT, DTFT and z-transform  
**CO5.** Understand the concept of sampling and reconstruction

**UNIT I: Introduction to Signals and Systems**

**(06 Hrs)**

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additively and homogeneity, shift-invariance, causality, stability, realizability. Examples.

**UNIT II: Behavior of continuous and discrete-time LTI systems**

**(08 Hrs)**

Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

**UNIT III Convolution**

**(04 Hrs)**

Convolution Sum, Convolution Integral and Their Evaluation, Time Domain Representation and Analysis of LTI Systems Based on Convolution and Differential Equations.

**UNIT IV Time and Frequency Domain Transformations****(17 Hrs)**

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and study of system behavior, The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

**UNIT V: Sampling and Reconstruction****(07 Hrs)**

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction, ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory, filtering, feedback control systems.

**Text Books:**

1. Oppenheim A.V., Willsky A.S. and Young I.T., "Signals and Systems", Second Edition, 1997, Prentice Hall.
2. Simon Haykin and Barry Van Veen, "Signals and Systems", Second Edition, Wiley International.

**Reference Books:**

1. R.F. Ziemer, W.H Tranter and J.D.R.Fannin, "Signals and Systems - Continuous and Discrete", Forth Edition Prentice Hall.
2. M. J. Roberts, "Signals and Systems", 2003, Tata McGraw-Hill

## **IV Semester B.E. (Electrical Engineering)**

### **DIGITAL ELECTRONICS**

**Total Credit- 04**

**Subject Code:- BEEE402T**

#### **Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -01 Hous/Week  
Practical- 02 Hours/week

#### **Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:-3 Hours

#### **Course Objectives**

Students will be able to –

- To provide basic knowledge and applications of logic gates and logic families.
- To provide basic understanding of Analog to digital and digital to analog converters.

#### **Course Outcomes:**

**After studying the course, the students will be able to demonstrate the ability to**

- CO1.** Understand number system, logic gates and logic families.
- CO2.** Design and implement combinational digital circuits.
- CO3.** Design and implement sequential logic circuits.
- CO4.** Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- CO5.** Understand memories and PLDs to implement given logic.

#### **UNIT I: Fundamentals of Digital Systems and Logic Families (07 Hrs)**

Number systems-binary, signed binary, binary arithmetic, one's and two's complements arithmetic, octal and hexadecimal number system , codes, error detecting and correcting codes, Digital Signals, basic digital circuits, NAND and NOR operations, Exclusive – OR and Exclusive NOR operations, Boolean algebra, Examples of IC gates, Digital logic families, TTL and Schottkky TTL and CMOS logic, interfacing CMOS and TTL, Tri-State logic.

#### **UNIT II: Combinational Digital Circuits (07 Hrs)**

Standard representation for logic functions, K-map representation (up to 4 variables), and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, use in combinational logic design, Adders, Subtractors, BCD arithmetic, carry, Arithmetic logic unit (ALU), popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices.

#### **UNIT III: Sequential circuits and systems (07 Hrs)**

A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K flip flop, T and D types flip-flops, excitation table of flip flop, conversion of flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial

converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

**UNIT IV: A/D and D/A Converters** **(07 Hrs):**

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit.

Analog to digital converters: quantization and encoding, parallel comparator, A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

**UNIT V: Semiconductor memories** **(08 Hrs).**

Memory organization and operation, expanding memory size, classification and characteristics of memories, Types of Memory commonly used memory chips.

**Programmable Logic Devices:** ROM as Programmable logic devices (PLD), Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA)

**Text Books /References:**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. H.Taub, "Digital Integrated Electronics" McGraw Hill
4. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
5. Herbert Taub, Donald LSchilling "Digital Integrated Electronics", McGraw Hill, 1977
6. Thomas C Bartee, "Digital Computer Fundamentals",McGraw Hill,1985.

**IV Semester B.E. (Electrical Engineering)  
DIGITAL ELECTRONICS**

**Total Credit- 01**

**Subject Code:- BEEE402P**

**Teaching Scheme**

Practical- 02 Hours/week

**Examination Scheme**

Pr (U)= 25Pr(I)=25

**Experiments based on the above syllabus with at least one experiment from each unit.**

## **IV Semester B.E. (Electrical Engineering)**

### **ELECTRICAL MACHINES-I**

**Total Credit- 04**

**Subject Code:- BEEE403T**

#### **Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -01 Hous/Week  
Practical- 02 Hours/week

#### **Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:-3 Hours

#### **Course Objectives**

Students will be able to –

- The Basic Principle of Transfer of Electrical Power Operation and Construction of Single Phase and Three Phase Transformer with Phasor diagram and Connection.
- The Construction, Principle and Applications of D.C.Machines.
- The Construction, Principle and Applications of Three Phase Induction Motor.
- The Construction, Principle and Applications of Three Phase Synchronous Machines.
- The Construction, Principle and Applications of Single Phase Machines and Special Machines.

#### **Course Outcomes:**

After Completing the Course, Students Will Be Able to –

- CO1.** Determine Equivalent Circuit parameter, Efficiency and Regulation of Single Phase Transformer and to Explain the Phasor groups of Three Phase Transformer.
- CO2.** Analyze different characteristics of D. C. Motor and Speed Control of D.C. Motor.
- CO3.** Explain different types of Three Phase Induction Motor and Analyze the characteristics at different Value of Slip.
- CO4.** Know Voltage Regulation of Three Phase Synchronous Generator and Behavior of Synchronous Motor with Different Excitations
- CO5.** Understand Single Phase Machines and Special Machines.

#### **Unit-I Single Phase Transformer**

**( 12-Hrs)**

Revision of Single Phase Transformer, Phasor Diagram Under Different Load Conditions, Losses, Equivalent Circuit, Open Circuit and Short Circuit Test, Voltage Regulation, Efficiency, Condition of Maximum Efficiency, All Day Efficiency, Polarity Test. Single phase Auto-Transformer, Working, Merits and Demerits. Applications.

**Three Phase Transformer:** -Principle and Operation, Connection and Phasor Groups, Polarity Test, Open Circuit and Short Circuit Test, Conditions of Parallel Operation.

**Unit II D.C. Machines** **(08-Hrs)**

Basic Principle and Operation of D.C. Motor and D.C. Generator, Emf Equation and Torque equation, Types of D.C. Machines, Characteristics and Speed Control of D.C. Shunt and D.C. Series Motor, Losses and Efficiency of D.C. Motor. Necessity of Starter and Constructional Details of Three Point Starter. Armature Reaction in D. C. Machines. Applications.

**Unit III Three Phase Induction Motor** **(08-Hrs)**

Construction Details, Types, Principle, Production of Torque, Torque Equation and Condition of Maximum and Starting Torque, Losses and Efficiency, Torque-Slip Characteristics, Behavior for Different values of Slip. No Load Test and Blocked Rotor Test. Starting methods of Three Phase Induction Motor. Applications.

**Unit IV Synchronous Machines** **(08-Hrs)**

**Three Phase Synchronous Generator :** -Introduction, Constructional features of Salient Pole and Cylindrical Pole Rotor Machines, Introduction to Armature Winding and Field Winding, Winding Factors and EMF Equation, Armature Reaction, Phasor Diagram Under Load Condition, Regulation and Synchronous Impedance Method to Find Voltage Regulation.

**Three Phase Synchronous Motor:** - Construction and Principle, Starting of Synchronous Motor, Motor on Load, Effect of Changing Field Excitation at Constant Load, V and Inverted-V Curves.

Applications.

**Unit V Single Phase Machines** **(07-Hrs)****Single Phase Induction Motor :-**

Principle and Operation, Double Field Revolving Theory. Principle and Working of Shaded Pole Induction Motor , Split Phase Induction Motor and Capacitor Start Capacitor Run Motor. Applications.

**Principle, Working And Applications Of Special Machines:-**

Universal Motor, Hysteresis Motor, Brushless D. C. Motor, A.C. Series Motor.

**TEXT BOOKS:-**

1. I. J. Nagrath , D.P. Kothari, “Electrical Machines,”, Tata McGraw- Hill Publishing Company Ltd.
2. P.S.Bhimbra,”Electrical Machinery”, Khanna Publishers.
3. P.K. Mukherjee, S. Chakrabarty, “ Electrical Machines”, Dhanpat Rai Publications.
4. P.S. Bhimbra , “Generalized Theory in Electrical Machines”, Khanna Publishers.
5. D C Kulshreshtha, “Basic Electrical Engineering,” The McGraw Hill Higher Education Private Limited, New Delhi.

6. S.G.Tarnekar, P.P. Kharbanda, S.B.Bodkhe, S.D. Naik , “ Laboratory Courses in Electrical Engineering,” S. Chand & Company Ltd., New Delhi.
7. Use of ICT Tools.

**REFERENCE BOOKS :-**

1. M.G.Say, “ Performance and Design of A.C. Machines,” CBS Publishers and Distributors Pvt. Ltd.
2. A.F. Fitzgerlad, Charles Kingdey, Jr. Stephan D. Umans, “Electrical Machinery”, Fifth Edition in SI Units, McGraw Hill Book Company.
3. D.P. Kothari, B.S.Umre, “Laboratory Manual for Electrical Machines,” Second Edition , I.K. International Publishing House Pvt.Ltd., New Delhi.

**IV Semester B.E. (Electrical Engineering)**

**ELECTRICAL MACHINES-I**

**Total Credit- 01**

**Subject Code:- BEEE403P**

**Teaching Scheme**

Practical- 02 Hours/week

**Examination Scheme**

Pr (U)= 25 Pr (I)=25

**10 EXPERIMENTS BASED ON ABOVE SYLLABUS.**

## **IV Semester B.E. (Electrical Engineering)**

### **POWER SYSTEM**

**Total Credit- 03**

**Subject Code:- BEEE404T**

#### **Teaching Scheme**

Theory-03 Hours/Week

Tutorial/ Activity -0

#### **Examination Scheme**

Th (U)= 70 Th(I)=30

Duration of University Exam:-3 Hours

#### **Course Objectives**

Students will develop the ability

- To model and represent the power system components, understand and calculate the transmission line parameter, evaluate its performance, understand the method of load flowanalysis and the concept of voltage stability.

#### **Course Outcomes:**

After Completing the Course, Students Will Be Able to –

- CO1.** Understand the basic structure of powersystem , smart grid and microgrid.
- CO2.** Model and represent the power systemcomponents in its per unit value.
- CO3.** Learn the parameters of transmission linesand cables.
- CO4.** Evaluate the performance of transmissionlines.
- CO5.** Acquaint with the method of load flowanalysis and the concept of voltage stability.

#### **UNIT- I: Evolution of Structure of Power Systems (08Hrs)**

Structure of power systems, brief exposure to generation, transmission and distribution aspects, Present-Day Scenario, Introduction to Smart Grids and Micro-grids, their components, Standardization of transmission voltages, Overhead and Underground transmission system, EHVAC verses HVDC transmission, HVDC Components, distribution connection scheme (radial, ring main and interconnected), Feeders and distributors, Substation and its equipments.

#### **UNIT- II: Per Unit Representation (06Hrs)**

Representation of power system elements, models and parameters of generator, transformer and transmission lines and load, voltage and frequency dependence of loads, single line impedance diagram, advantages of per unit representation.

#### **UNIT-III: Overhead Transmission Lines and Cables (10Hrs)**

Components of overhead lines, choice of conductors, Skin effect, Proximity effect, Corona, Transposition of conductors, Bundled conductor, Types of insulators , string efficiency, Method to improve string efficiency, Derivation for Inductance of a single phase line, concept of self GMD and mutual GMD, Derivation for Capacitance of a single phase line, Insulated Cables, Dielectric stress in single core cables, Grading of cables, XLPE cables.

**UNIT-IV: Performance of Transmission line** **(08Hrs)**

Classification of transmission line (short, medium (nominal T and nominal  $\Pi$ ) and long), Characteristics (voltage regulation and efficiency) of transmission lines, determination of generalised (A,B,C,D) constants for transmission line, Ferranti effect, Surge Impedance Loading, Series and Shunt Compensation of transmission lines (using capacitors only) .

**UNIT-V: Load Flow Studies** **(08Hrs)**

Introduction to load flow studies, Classification of buses , Formation of bus admittance matrix, Static load flow equations, Gauss Seidel and Newton-Raphson method for solution (Numerical is not expected), Introduction of frequency and voltage as system state indicators, Concept of Voltage Stability, P-V and V-Q curves, Methods to improve voltage stability.

**Text Book**

1. I. J. Nagrath, D. P. Kothari, Power System Engineering, Tata McGraw-Hill publications, 2008
2. Ashfaq Husain, Electrical Power System, CBS Publication, 5th Edition
3. C. L. Wadhwa, Electrical Power Systems, New Age International Publiser, 6th Edition
4. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand Publication, 2008

**Reference Books:**

1. W.D. Stevenson, Elements of power system analysis, McGraw-Hill publications, 3rd Edition
2. O. I. Elgerd, Electric Energy Systems Theory: An Introduction, McGraw-Hill publications, 2ndEdition
3. Hadi Saadat, Power System Analysis , TMH , 2002
4. James A Momoh, Smart Grid : Fundamentals of Design and Analysis, Wiley 2012
5. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, “Smart Grid: Technology and Applications”,Wiley 2012

**IV Semester B.E. (Electrical Engineering)****ELECTROMAGNETIC FIELDS****Total Credit- 04****Subject Code:- BEEE405T****Teaching Scheme**

Theory-03 Hours/Week

Tutorial/ Activity – 01 Hours/week

**Examination Scheme**

Th (U)= 70 Th(I)=30

Duration of University Exam:-3 Hours

**Course Objectives**

Students will be able to –

- Introduce the concepts of different coordinate systems, Maxwell's equations, static electric and magnetic fields and methods of solving for the quantities associated with these fields, time varying fields and displacement current.

**Course outcomes**

At the end of this course students will demonstrate the ability to

- CO1.** Recognize and apply the knowledge of different co-ordinate systems.
- CO2.** Evaluate the physical quantities of electromagnetic fields in different media and apply Gauss law.
- CO3.** Describe static electric fields boundary conditions, nature of dielectric materials and evaluate potential fields.
- CO4.** Explain steady magnetic fields, their behavior in different media, associated laws and inductance.
- CO5.** Understand Maxwell's equations in different forms and different media.

**Unit I: Review of Vector Analysis:** **(08 Hrs)**

Review of Scalars and vectors, Vector Algebra, Rectangular Co-ordinate System, Cylindrical Co-ordinate System, Spherical Co-ordinate System and transformation of Cartesian to Cylindrical, Cartesian to Spherical and vice versa.

**Unit II: Coulomb's law, Electrical field intensity and electric flux density, Gauss's law, Divergence:** **(08 Hrs)**

Coulombs Law, Electric field intensity, field due to continuous volume charge distribution, field of point charge, field of line charge, field of sheet charge, Electric Flux density, Gauss's law and Applications of Gauss's law, the divergence theorem.

**Unit III: Potential of charge system , Conductors, Dielectric, Capacitance and poison's and Laplace Equations:** **(07 Hrs)**

Definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, potential gradient. Metallic conductors, conductor properties, the

nature of dielectric materials, boundary conditions for perfect dielectric materials, Capacitance of parallel plate capacitor, capacitance of two wire line, Poisons and Laplace Equation.

**Unit IV: The steady Magnetic Field and Magnetic forces:** (08 Hrs)

Biot Savart's law, Ampere's Circuital law, Stoke's theorem, magnetic flux density, scalar and vector magnetic potentials. Force on moving charge, force between differential current elements, nature of magnetic material, Magnetization and permeability, Inductance and mutual inductance.

**Unit V: Boundary conditions, Maxwell's equation and wave propagation:** (08 Hrs)

Magnetic boundary conditions, Faraday's law, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Wave propagation, Poynting vector, skin effect.

**Text books:**

1. W.H. Hayt , "Engineering Electromagnetics" ,TMH Publication 2006

**Reference books:**

1. N.N.Rao Electromagnetic Engg. V Edition ,Prentice Hall. 2005
2. Fawwaz T.Ulaby Applied Electromagnetics, Prentice Hall. 1999
3. Krauss Electromagnetic Engg. IV Edition,Tata Mc Graw Hill. 2003
4. Shevgaonkar Electromagnetic Waves,Tata Mc Graw Hill 2002
5. Matthew, N. O. Sadiku Elements of Electromagnetics, Oxford University publication, 6th edition, 2014.

**IV Semester B.E. (Electrical Engineering)**  
**SIMULATION & PROGRAMMING TECHNIQUES**

**Total Credit- 03**  
**Subject Code:- BEEE406T**

**Teaching Scheme**

Theory-03 Hours/Week  
Tutorial/ Activity -0  
Practical:-02 Hours/ week

**Examination Scheme**

Th (U)= 70 Th(I)=30  
Duration of University Exam:-3 Hours

**Course Objectives**

Students will be able to –

- The concept of programming and topics using C & C++ language and apply it in the field of engineering and technology. Similarly student will know about the MATLAB, various matrix operation and use of graphic tools for representation.

**Course outcomes**

At the end of this course students will be able to

- CO1.** Learn the basics of C programming and apply the knowledge for developing small programs including Function.
- CO2.** Apply the knowledge of C language for developing simple programs using variables, arrays, structures etc. for applications like searching and sorting, use of pointers & File handling functions.
- CO3.** Understand the basics of C++
- CO4.** Study the basic of MATLAB and apply fundamental knowledge for analysis of basic engineering problems.
- CO5.** Apply knowledge of MATLAB, Toolboxes and Simulink to solve matrix equations, plot graphs, build and analyze simple electrical circuits.

**Unit-I:** **(08 Hrs)**

Structure of C program, Data types, Variables, Input/output statements, Storage class, operators, Program control statements, Concept of function & Recursion

**Unit-II:** **(08 Hrs)**

Introduction to Arrays, Programs with Arrays, Searching (Linear & Binary), Sorting (Bubble & Selection), Introduction to Structures, Simple programs using structures, Introduction to Pointers, File Handling

**Unit III:**

Introduction to C++ concepts **(06 Hrs)**

**Unit-IV:** **(08 Hrs)**

Introduction to MATLAB Programming, Import/export data, Program and run simple scripts (M-files), Use graphics tools to display data, Conditional Statements (If-else, if-else-if), and Iterative statements (while, for loop)

**Unit -V:** **(10 Hrs)**

Matrix operation (Transpose, Determinant, Inverse), Plotting of graphs (Basic plot, generating waveforms) using MATLAB Programming. Programming using MATLAB functions, Introduction to Toolbox (SimPower system, Control System) and Simulink

**Text Book**

1. Kakade & Deshpande, A text book on Programming languages C & C++, DREAMTECH PRESS 2nd . Ed.
2. E. Balgurusami, Programming in ANSI- C, TATA MCGRaw-HILL Publishing Company Ltd.
3. Y. Kanetka, Let us C, 8 th BPB PUBLICATIONS
4. Jaydeep Chakravorty Introduction to MATLAB Programming, Toolbox & Simulink, Universities Press
5. Stephen Chapman, MATLAB Programming for Engineers, 4<sup>th</sup> Edition, CENGAGE Learning

**Reference Book**

1. B.W. Kernighan and D.M. Ritchie, C Programming languages, 2 nd EDITION PEARSON EDUCATION
2. Stormy Attaway, METLAB-A Practical introduction to programming problem Solving, Elsevier
3. Duane Hanselman Bruce Littlefield, Mastering METLAB, Pearson

**IV Semester B.E. (Electrical Engineering)  
SIMULATION & PROGRAMMING TECHNIQUES  
Total Credit- 01  
Subject Code:- BEEE406T**

**Teaching Scheme**

Practical:-02 Hours/ week

**Examination Scheme**

Pr (U)= 25 Pr(I)=25

**10 EXPERIMENTS BASED ON ABOVE SYLLABUS.**

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S.)**  
**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

Subject : Discrete Mathematics and Graph Theory Subject Code : BECSE401T

| Load               | Credit | Total Marks | Internal Marks | University Marks | Total |
|--------------------|--------|-------------|----------------|------------------|-------|
| 03 Hrs<br>(Theory) | 03     | 100         | 30             | 70               | 100   |

**Aim:** To develop background in modern computer science, in particular logic, relations, combinatorics and graph theory so that students can better understand the algorithms.

**Pre Requisites:**

1. Basic concepts of logic, matrices and combinatorics.
2. Higher secondary school mathematics through trigonometry.

**Course Objectives:**

1. A primary objective is to provide a bridge for the student from lower-division mathematics courses to upper-division mathematics.
2. Obtain skills and logical perspectives in introductory (core) courses that prepare them for subsequent courses.
3. Develop proficiency with the techniques of mathematics and/or computer science, the ability to evaluate logical arguments, and the ability to apply mathematical methodologies to solving real world problems.

**Course Outcomes:**

After completing the course, the students will be able to

1. Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction.
2. Gain an introduction into how mathematical models for engineering are designed, analyzed and implemented in industry and organizations.
3. Reason mathematically about basic data types and structures (such as numbers, sets, graphs, and trees) used in computer algorithms and systems; distinguish rigorous definitions and conclusions from merely plausible ones.
4. Analyze real world scenarios to recognize when Logic, sets, functions are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in

order to solve the problems using multiple approaches.

5. Apply knowledge of mathematics, physics and modern computing tools to scientific and engineering problems.
6. Apply their knowledge in life-long learning.

**Unit 1: Set Theory, Relations and Functions** (08 Hrs)

**Sets:** Review of propositions and logical operations, Principle of mathematical induction, Review of sets, Types and operations on sets.

**Relations:** Ordered pairs and n-tuples, Types of relations, Composite relation, Transitive closure of a relation, Partially ordered set, Hasse diagrams.

**Functions:** Definition, Composition of functions, Types of functions, Characteristics function and its properties.

**Unit 2: Fuzzy Set and Fuzzy Logic** (07 Hrs)

Fuzzy sets and systems, Crisp set, Operations and combinations on Fuzzy sets, Relation between Crisp set and Fuzzy set, Fuzzy relations, Overview of Fuzzy logic and classical logic.

**Unit 3: Group Theory and Ring Theory** (07 Hrs)

Binary operation, Algebraic structure, Groupoid, Semigroup, Monoid, Group, Subgroup, Normal subgroup (Only definitions and examples), Ring, Commutative ring, Ring with unity, Zero divisor, Integral domain, Field (Only definitions and simple examples).

**Unit 4: Graph Theory** (07 Hrs)

Basic concepts of graph theory, Digraphs, Basic definitions, Matrix representation of graphs, Subgraphs and quotient graphs, Isomorphic graphs, Paths and circuits, Reachability and connectedness, Node base, Euler's path & Hamilton's path, Tree, Binary tree, Undirected tree, Spanning tree, Weighted graphs (Only definitions and examples), Minimal spanning tree by Prim's algorithm & Kruskal's algorithm, Representation of algebraic expressions by Venn diagram and binary tree.

**Unit 5: Combinatorics** (07 Hrs)

Permutations and combinations, Pigeonhole principle with simple applications, Recurrence relations (Concept and definition only), Generating functions, Solution of recurrence relations using generating functions.

**Text/ Reference Books**

- (1) Discrete Mathematical Structures (PHI), B. Kolman, R. Busby, S. Ross.
- (2) Discrete Mathematical Structures with Applications to Computer Science (TMH), Tremblay and Manohar.
- (3) Fuzzy Sets Uncertainty and Information, George, J. Klir, Tina A. Folger.



- (4) Discrete Mathematics for Computer Scientists & Mathematicians, J. Mott, A. Kandel, T. Baker.  
(5) Discrete Mathematics, S. Lipschutz.  
(6) Neural network and Fuzzy systems (PHI), Bart Kosko.

A handwritten signature in blue ink, appearing to be "S. Lipschutz".

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S.)**  
**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

| Subject :                                 |        |             | Data Structure and Program Design | Subject Code :   | BECSE402T |
|---|--------|-------------|-----------------------------------|------------------|-----------|
| Load                                      | Credit | Total Marks | Internal Marks                    | University Marks | Total     |
| 03 Hrs<br>(Theory)<br>01 Hr<br>(Tutorial) | 04     | 100         | 30                                | 70               | 100       |

**Aim :** To understand the implementation of various data structures and algorithms.

**Prerequisite(s):** C Language

**Course Objective/Learning Objective:**

|   |   |
|---|---|
| 1 | To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. |
| 2 | To implement data structure Algorithms by using C/C++ Language.   |
| 3 | To select an appropriate data structure to solve real world problem and compare alternative implementations of data structures with respect to performance.     |
| 4 | To acquire knowledge on Searching and Sorting techniques.   |

**Course Outcome:**

At the end of this course Student are able to:

|     |  |
|-----|--|
| CO1 | Analyze the complexity of algorithms and sorting techniques.   |
| CO2 | Apply the concept of stack and queues to solve real world problem.   |
| CO3 | Describe and implement linked list operation.  |
| CO4 | Demonstrate different methods for traversing trees.  |
| CO5 | Utilize the concepts of graphs to build solution. Design and implement searching techniques and hashing function |

**UNIT I:**

(08 Hrs)

**Introduction to algorithm:** General concepts of data structures, Types of Data Structure with its properties and Operations, Time and space analysis of algorithms, Big oh, theta, and omega notations, Average, best and worst case analysis.

**Sorting and Searching Techniques:** Selection sort, insertion sort, heap sort, shell sort, linear and binary search.



**UNIT II:** (07 Hrs)

**Stack & Queue:** Representation of Stack & queue using array, Application of stacks, Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks, Linear Queues, Circular Queues, and Priority Queues.

**UNIT III:** (07 Hrs)

**Linked List:** Representation of ordered list using array and its operation, Linked Lists, Singly linked list, Implementation of linked list using static and dynamic memory allocation, operations on linked list, polynomial representations using linked list, circular linked list, doubly linked list.

**UNIT IV:** (07 Hrs)

**Trees:** General and binary trees, Representations and traversals of trees, Threaded Binary Trees, Binary search trees, the concept of balancing, AVL Trees, B-Trees, B+ Trees.

**UNIT V:** (07 Hrs)

**Graphs:** Representation of Graph, Matrix Representation of Graph, List Representation of Graph, Directed Graphs(Digraphs), Breadth first search and Depth first search, spanning trees.

**Hashing:** Hash tables, hash functions, hashing techniques, Collision resolution techniques, overflow handling.

**Textbooks:**

- Classical Data Structure, D. Samanta, Prentice Hall of India.
- Data Structures using C, Aaron M. Tanenbaum, Pearson Education.
- Data Structure with C, Seymour Lipschutz, Tata Mcgraw Hill.

**References:**

- Ellis Horowitz, Sartaj Sahni & Susan Anderson-Freed, Fundamentals of Data Structures in C, Second Edition, Universities Press.
- An Introduction to Data Structures and Applications, Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, Tata McGraw Hill Publication.
- Data Structures using C and C++, Y. Langsam, Pearson Education.
- Algorithms in a Nutshell, George H & Garry, O'reilly Publication.
- Data Structure and Algorithms using Python, Rance D. Necaise, John Wiley Publication.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: FOURTH (C.B.C.S)**

**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

Subject : Data Structure and Program Design

Subject Code : BECSE402P

| Load                  | Credit | Total Marks | Internal Marks | University Marks | Total |
|-----------------------|--------|-------------|----------------|------------------|-------|
| 02 Hrs<br>(Practical) | 01     | 50          | 25             | 25               | 50    |

- Ten Practicals based on syllabus. Course coordinator should make sure that all units will be covered in their list. No study experiment should be included in the list.

**Textbooks:**

- Classical Data Structure, D. Samanta, Prentice Hall of India.
- Data Structure with C, Seymour Lipschutz, Tata Mcgraw Hill.
- Data Structures using C, Aaron M. Tanenbaum, Pearson Education.

**References:**

- An Introduction to Data Structures and Applications, Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, Tata McGraw Hill Publication.
- Data Structures using C and C++, Y. Langsam, Pearson Education.
- Algorithms in a Nutshell, George H & Garry, O'reilly Publication.
- Data Structure and Algorithms using Python, Rance D. Necaise, John Wiley Publication.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S)**  
**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

**Subject:** Database Management Systems

**Subject Code:** BECSE403T

| Load               | Credit | Total Marks | Internal Marks | University Marks | Total |
|--------------------|--------|-------------|----------------|------------------|-------|
| 03 Hrs<br>(Theory) | 03     | 100         | 30             | 70               | 100   |

**Aim:** To understand and implement the concepts of databases in order to gain the proficiency at application level.

**Prerequisite(s):** Basic concept of file processing and fundamentals of operating systems.

**Course Objective/Learning Objective:**

|   |   |
|---|---|
| 1 | To understand general idea of database management systems.  |
| 2 | To develop skills to design databases using data modeling and design techniques.  |
| 3 | To develop skills to implement real life applications which involve database handling.  |
| 4 | Demonstrate an understanding of career opportunities in subject areas of designing, storage techniques, data handling and managing techniques |

**Course Outcome:**

At the end of this course Student are able to:

|            |   |
|------------|---|
| <b>CO1</b> | <b>Understand</b> basic database concepts and data modeling techniques used in database design.   |
| <b>CO2</b> | <b>Study</b> the concept of functional dependency and <b>Perform</b> the calculus with <b>Design</b> database by using different normalization technique. |
| <b>CO3</b> | <b>Study</b> query processing and <b>Perform</b> optimization on query processing.  |
| <b>CO4</b> | <b>Understand</b> the concept of transaction processing and different recovery technique used in RDBMS.   |
| <b>CO5</b> | <b>Study</b> and <b>Implement</b> advanced databases which are used real time system.   |

**UNIT I:**

**(07 Hrs)**

**Introduction to database systems:** Approaches to building a database, Three-schema architecture of a database, Challenges in building a DBMS, DBMS Architecture-Various components of a DBMS, Types of data models.

**UNIT II:**

**(08 Hrs)**

**Relational Data Model:** Concept of relations, Schema-instance distinction, Keys, referential integrity and foreign keys, Relational algebra operators, Tuple relation calculus, Domain relational

calculus. **Physical and logical hierarchy:** Concept of index, B-trees, hash index, function index, bitmap index. Concepts of Functional dependency, Normalization (1NF,2NF,3NF,BCNF, etc).

**UNIT III:** (07 Hrs)  
**Query Processing and Optimization:** Query Processing and Optimization process, measures of query cost estimation in query optimization, pipelining and Materialization, Structure of query evaluation plans.

**UNIT IV:** (07 Hrs)  
**Transactions:** Transaction concepts, properties of transactions, Serializability of transactions, Testing for serializability, System recovery, Two-Phase Commit protocol, Recovery and Atomicity, Log based recovery, concurrent executions of transactions, Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Isolation.

**UNIT V:** (07 Hrs)  
**Recovery System and advanced databases:** Failure classification, recovery and atomicity, log based recovery, checkpoints, buffer management, advanced recovery techniques, Web databases, Distributed databases, Data warehousing, Data mining, Data Security, NOSQL databases.

**Textbooks:**

- Database System Concepts by Avi Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw Hill, Fifth Edition.
- Fundamentals of Database Systems – Elmasri and Navathe, Addison Wesley, 2000.
- An introduction to Database Systems, C J Date, A. Kannan, S. Swamynathan –Eight Edition.

**Reference books:**

- Database Management Systems - by Raghu Ramakrishnan and Johannes Gehrke, Tata McGraw Hill Publication, Third Edition.
- Introduction to Database Management Systems by Kahate, Pearson Education.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: FOURTH (C.B.C.S)**

**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

Subject : Database Management Systems Subject Code : BECSE403P

| Load                  | Credit | Total Marks | Internal Marks | University Marks | Total |
|-----------------------|--------|-------------|----------------|------------------|-------|
| 02 Hrs<br>(Practical) | 01     | 50          | 25             | 25               | 50    |

- Ten Practicals based on syllabus. Course coordinator should make sure that all units will be covered in their list. No study experiment should be included in the list.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE & ENGINEERING**

**Subject:** Computer Networks

**Subject Code:** BECSE404T

| Load               | Credits | Total Marks | Internal Marks | University Marks | Total |
|--------------------|---------|-------------|----------------|------------------|-------|
| 03 Hrs<br>(Theory) | 03      | 100         | 30             | 70               | 100   |

**Aim:** To understand networking concepts and various protocols used in Computer Network.

**Prerequisite(s):** Basics of data communication, networking concepts and computer architecture.

**Course Objectives:**

|   |  |
|---|--|
| 1 | To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model. |
| 2 | To study the fundamentals and basics of Physical layer, and will apply them in real time applications.                         |
| 3 | To study data link layer concepts, design issues, and protocols.   |
| 4 | To Gain core knowledge of Network layer routing protocols and IP addressing.   |
| 5 | To study process-to-process communication and Congestion control mechanism.  |
| 6 | To study about domain name, Application layer and network management.  |

**Course Outcomes:**

At the end of this course Student are able to:

|     |  |
|-----|--|
| CO1 | Describe the functions of each layer in OSI model along with basic networking concepts.  |
| CO2 | Explain physical layer functionality and its working along with transmission media with real time applications.                        |
| CO3 | Describe the functions of data link layer and explain the protocols used in data link layer.   |
| CO4 | Classify the routing protocols and analyze how to map IP addresses. Identify the issues related to transport layer, congestion control |
| CO5 | Describe Quality of Service, DNS, Application layer protocols & Network security issues.   |

**Unit I:**

**(07 Hrs)**

**Introduction to Data Communication:**

Data Communication Components, Data Representation, data flow (Simplex, Half-Duplex and Full-Duplex mode), Network Criteria, Type of connection, physical topology, Categories of Network (LAN, MAN, WAN,PAN), study of OSI reference model.

**Unit II:** (07 Hrs)

**Physical Layer and Media:**

Analog and digital Data, Analog and digital signals, TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission. COMMUNICATION MEDIA: guided media and unguided.

**Unit III:** (07 Hrs)

**Data Link Layer:**

Types of errors, framing (character and bit stuffing), Protocols: for noiseless channels (Simplex, Stop and wait), for noisy channels (Stop and wait ARQ, Go back-N ARQ, Selective repeat ARQ), Point-to-Point (PPP), Multiple Access Protocol: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA.

**Unit IV:** (07 Hrs)

**Network Layer:**

IPv4 Addresses, IP addressing Methods with sub-netting and super-netting, **Routing Protocols:** Distance Vector, Link State, Path Vector.

**Transport Layer:**

Duties of transport layer, Process-to-process delivery, Congestion control: Data Traffic, Congestion control Category (Open loop, closed loop),

**Unit V:** (08 Hrs)

**Quality of Service:** Introduction to QoS, Techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm. **Application Layer:** Domain Name System, Functions of Network management system, Voice over IP, Firewall

**Text Books:**

- B. A. Forouzan – “Data Communications and Networking (3rd Ed.)” – TMH
- A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI
- W. Stallings – “Data and Computer Communications (8th Ed.)” – PHI/ Pearson Education

**Reference Books:**

- Kurose and Rose – “Computer Networking -A top down approach featuring the internet” – Pearson Education
- Introduction to Data Communications and Networking by Wayne Tomasi-Pearson Edition
- Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S)**  
**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

**Subject :** Theory of Computation

**Subject Code:** BECSE405T

| Load                                      | Credit | Total Marks | Internal Marks | University Marks | Total |
|---|--------|-------------|----------------|------------------|-------|
| 03 Hrs<br>(Theory)<br>01 Hr<br>(Tutorial) | 04     | 100         | 30             | 70               | 100   |

**Aim:** The main motivation behind developing Theory of Computation was to develop methods to describe and analyze the dynamic behavior of discrete systems.

**Prerequisite(s):** Basics of Discrete Mathematics

**Course Objective/Learning Objective:**

|   |  |
|---|--|
| 1 | To discuss the Chomsky classification of formal language with discussion on grammar and automata for regular, context-free, context sensitive and unrestricted language. |
| 2 | Understand the basic properties of Turing machines and computing with Turing machines.   |
| 3 | To discuss the notion of decidability.   |
| 4 | To compute Ackerman function and analyze recursively and non-recursively enumerable language   |

**Course Outcome:**

At the end of this course Student are able to:

|            |  |
|------------|--|
| <b>CO1</b> | Design finite automata and its minimization along with Moore and Mealy machines.                     |
| <b>CO2</b> | Apply regular expression and create grammar for the same.  |
| <b>CO3</b> | Deal with context free grammar and various normal forms of CFGs.                                     |
| <b>CO4</b> | Create Push Down Automata for the given CFG and inter-conversion of the same.                        |
| <b>CO5</b> | Create Turning Machine for the grammar and Deal with Recursive and Recursively Enumerable Languages. |

**UNIT I:** (08 Hrs)  
**Finite Automata (FA):** Basic Terminology and Definitions, Chomsky hierarchy, Deterministic Finite Automata , language of a DFA. Nondeterministic Finite Automata, Equivalence of Deterministic and Non-deterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion.

**UNIT II:** (07 Hrs)  
**Regular Grammars (RG):** Definition, regular grammars and FA, Conversion. Proving languages to be non-regular, Pumping lemma, applications, Closure properties of regular languages.

**Regular Expressions (RE):** Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions, Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions.

**UNIT III:** (07 Hrs)  
**Context Free Grammar (CFG):** Definition, Parse Tress, Derivation Trees, Rightmost and Leftmost derivations of Strings and Conversions. Ambiguity in CFGs, Minimization of CFGs, Normal forms for CFG, Pumping Lemma for CFLs.

**Unit -IV:** (07 Hrs)  
**Push down Automata (PDA):**Definition, Model, Non-determinism, acceptance by two methods and their equivalence, conversion of PDA to CFG, CFG to PDAs, closure and decision properties of CFLs.

**UNIT V:** (07 Hrs)  
**Turing Machines (TM) :** Formal definition and behavior, Languages of a TM, TM as acceptor, TM as transducers, Variations of TM, Linear Bounded Automata, TM as computer of function. Properties of recursive and recursively enumerable languages, Recursively enumerable set, Undecidability, Decidability and solvability, Post correspondence Problem, Primitive recursive functions, Ackerman function

**Textbooks:**

- John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory Languages and Computation, 3<sup>rd</sup> edition, Pearson Education.
- Michael Sipser, Introduction to the Theory of Computation, 3<sup>rd</sup> edition, Cengage Learning.
- Peter Linz, An Introduction to Formal Languages and Automata, 5th Edition, Malloy, Inc.



- Vivek Kulkarni, Theory of Computation, Oxford University Press, ISBN-13: 978-0-19-808458-7.
- Theory of Computation - O.G. Kakde ,University Science Press

**Reference books:**

- K. L. P Mishra, N. Chandrashekaran , Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
- John C Martin, Introduction to languages and the Theory of Computation, TMH
- Daniel I.A. Cohen, John Wiley, Introduction to Computer Theory.
- P.K. Srimani, Nasir S, A Text book on Automata Theory, Cambridge University Press.
- Kamala Krithivasan, Rama R, Introduction to Formal languages Automata Theory and Computation Pearson.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**

**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**

**SEMESTER: FOURTH (C.B.C.S.)**

**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

Subject : System Programming

Subject Code:

BECSE406T

| Load                | Credit | Total Marks | Internal Marks | University Marks | Total |
|---------------------|--------|-------------|----------------|------------------|-------|
| 03 Hrs.<br>(Theory) | 03     | 100         | 30             | 70               | 100   |

**Aim:** To understand about system programs and device drivers.

**Prerequisite(s):** Data Structures, Theoretical computer science, Operating system, Computer Architecture

**Course Objective/Learning Objective:**

|   |   |
|---|---|
| 1 | To acquire knowledge about various system software programs                             |
| 2 | To understand the design of Assembler   |
| 3 | To understand concept and design of microprocessor and various types of loaders         |
| 4 | To understand the working of Compiler, Interpreter and various types of device drivers. |

**Course Outcome: -**

After learning the course, the students should be able to:

|     |   |
|-----|---|
| CO1 | Identify the relevance of different system programs.  |
| CO2 | Describe the various data structures and passes of assembler design.  |
| CO3 | Identify the need for different features and designing of macros  |
| CO4 | Distinguish different loaders and linkers and their contribution in developing efficient user applications. |
| CO5 | Grab the concepts of phases of compiler, LEX and YACC   |

**Unit I:**

**(08 Hrs)**

**Introduction to Systems Programming**

Introduction of Components of System Software: - Assemblers, Loaders, Macros, Compilers, and Formal Systems. Operating System, computer language, Machine Architecture IBM 360/370, Instruction Formats, Data Formats, System Software Development, Recent Trends in Software Development, Levels of System Software, computer languages: Machine language, assembly language.

**Unit II: Assembler** (07 Hrs)

Elements of Assembly language programming, Data base for assembler design, Types of Assemblers, design of two-pass assembler and single pass assembler.

**Unit III: Macro and Macro Processors** (07 Hrs)

Introduction, Macro Definition and Call, Macro Expansion, Functions of a Macro Processor, Basic Tasks of a Macro Processor, Features of macro, Design Issues of Macro Processor, design of macro processor

**Unit IV: Linker and Loader** (07 Hrs)

Introduction, Task of Loader, Relocation and Linking concepts, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, design of direct linking loader. Linker's v/s Loaders

**Unit V: Compiler, Interpreters, Debuggers & Device Driver** (07 Hrs)

Compilers: Basic compilers function, Phases of compilers, Lexical Analysis- Role of Finite State Automata in Lexical Analysis, Design of Lexical analyzer, data structures used, Syntax Analysis- Role of Context Free Grammar in Syntax analysis Study of LEX & YACC. Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Comparative study between device drivers for UNIX & Windows

**Text Books: -**

| Sr. No. | Title                               | Author                  | Publication                |
|---------|-------------------------------------|-------------------------|----------------------------|
| 1       | System Programming                  | J. J. Donovan           | Tata McGraw-Hill Education |
| 2       | System Programming                  | D M Dhamdhere           | McGraw Hill Publication    |
| 3       | System Software                     | Santanu Chattopadhyay   | Prentice - Hall India,2007 |
| 4       | UNIX programming Tools LEX and YACC | Levine, Mason and Brown | O'Reilly                   |

**Reference Books: -**

| Sr. No. | Title  | Author                   | Publication                  |
|---------|--|--------------------------|------------------------------|
| 1       | System Software – An Introduction to Systems Programming | Leland L. Beck           | Pearson Education Asia, 2000 |
| 2       | Principles of Compiler Design                            | Aho and Ullman           | Pearson Education            |
| 3       | System Programming and Compiler Construction             | R.K. Maurya & A. Godbole | Kindle Edition               |
| 4       | System Programming                                       | Srimanta Pal             | OXFORD Publication           |

**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S)**

**BRANCH: COMPUTER SCIENCE AND ENGINEERING**

**Subject:** Computer Workshop-II-Lab

**Subject Code:** BECSE407P

| Load                  | Credits | Total Marks | Internal Marks | University Marks | Total |
|-----------------------|---------|-------------|----------------|------------------|-------|
| 02 Hrs<br>(Practical) | 01      | 50          | 25             | 25               | 50    |

**Aim:** To implement the concepts of python programming

**Prerequisite(s):** C programming and basics of object oriented programming

**Course Objectives:**

|   |   |
|---|---|
| 1 | To implement various concepts of python programming   |
| 2 | To gain hands on experience on organizing python codes using object oriented programming concepts |

**Course Outcomes:**

At the end of this course Student are able to:

|     |   |
|-----|---|
| CO1 | Declare python operators, numeric data types and string operations  |
| CO2 | Implement tuple, conditional blocks and loops in python   |
| CO3 | Apply functions, modules, and packages using python   |
| CO4 | Handle exceptions, sorting algorithms and various data structures   |
| CO5 | Implement various file operations using python and Implement concepts of object oriented programming and python database connectivity |

**UNIT I:**

Origin of Python, Python versions, Features of Python, Installation and Working with Python, Identifiers, Keywords, Understanding Python variables , Python basic Operator ,Declaring and using Numeric data types: int, float, complex Using string data type and string operations

**UNIT II:**

Defining list and list slicing ,Use of Tuple, frozenset, map, dictionary, Non data type, Math functions, Conditional blocks using if, else and else if, Simple for loops in python, for loop using ranges, string, list and dictionaries ,Use of while loops in python, Loop manipulation using pass, continue, break and else.

**UNIT III:**

Organizing python codes using functions, Organizing python projects into modules ,Importing own module as well as external modules Understanding ,Packages Powerful Lamda function in python ,Programming using functions, modules and external packages,

#### **UNIT IV:**

Handling Exceptions, try catch block, Finally Block, Possible combination of try catch and finally block, Regular expression, Search Algorithms, Sorting Algorithms, Link List, Stack, Queues, Dequeues Hash Tables.

#### **UNIT V:**

Reading config files in python,Writing log files in python, Understanding read functions, read(), readline() and readlines(),Understanding write functions, write() and writelines, Manipulating file pointer using seek Programming using file operations

Classes and Object-Oriented Programming, Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding, Graphical User interface, Networking in Python, Python database connectivity,

#### **Books Recommended:**

##### **Text Books:**

- ‘Head-First Python’ (2<sup>nd</sup>Edition) by Paul Barry, O'Reilly Publications

##### **Reference Books:**

- John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India
- R. Nageswara Rao, “Core Python Programming”, Dreamtech
- Wesley J. Chun. “Core Python Programming - Second Edition”, Prentice Hall

##### **Note:**

1. There should be at the most two practicals per unit.
2. Minimum ten practical's have to be performed based on above syllabus.
3. Do not include study experiment.



**RASHTRASANT TUKADOJI MAHARAJ NAGPUR UNIVERSITY, NAGPUR**  
**FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE**  
**SEMESTER: FOURTH (C.B.C.S)**

Subject : Internship Subject Code : BECSE408

| Load                  | Credit | Total Marks | Internal Marks | University Marks | Total |
|-----------------------|--------|-------------|----------------|------------------|-------|
| 02 Hrs<br>(Practical) | 01     | 50          | 50             | -                | 50    |

- Student should have to undergo minimum internship of two to four weeks. After completion of the internship report of the same should be submitted to the department. Minimum one month internship is desirable

*Sonal*  
Dr. S. V. Sonelal  
Chairman

## **SYLLABUS: VI SEMESTER (Computer Science and Engineering) (C.B.S.)**

### **BECSE306T:Artificial Intelligence**

| Load                              | Credit | Total marks | Sessional marks | University marks | Total |
|-----------------------------------|--------|-------------|-----------------|------------------|-------|
| 4 hrs (Theory)<br>1 hr (Tutorial) | 5      | 100         | 20              | 80               | 100   |

#### **UNIT – I:**

**Introduction:** What is AI? History & Applications, Artificial intelligence as representation & Search, Production system, Basics of problem solving: problem representation paradigms, defining problem as a state space representation, Characteristics.

#### **UNIT – II:**

**Search Techniques:** Uninformed Search techniques, Informed Heuristic Based Search, Generate and test, Hill-climbing, Best-First Search, Problem Reduction, and Constraint Satisfaction.

#### **UNIT – III:**

**Knowledge representation:** Knowledge representation Issues: First order logic, Predicate Logic, Structured Knowledge Representation: Backward Chaining , Backward Chaining , Resolution ,Semantic Nets, Frames, and Scripts, Ontology.

#### **UNIT – IV:**

**Uncertainty:** Handing uncertain knowledge, rational decisions, basics of probability, axioms of probability, Baye's Rule and conditional independence , Bayesian networks , Exact and Approximate inference in Bayesian Networks, Fuzzy Logic .

#### **UNIT – V:**

**Learning:** What is learning?, Knowledge and learning, Learning in Problem Solving, Learning from example, learning probabilistic models, Formal Learning Theory

#### **UNIT – VI:**

**Expert Systems:** Fundamental blocks, Knowledge Engineering, Knowledge Acquisition, Knowledge Based Systems, Automated Reasoning, Understanding Natural language

#### **Text Books:**

1. E.Rich and K. Knight, Artificial Intelligence, Tata McGraw Hill, 2008.
2. Artificial intelligence and soft computing for beginners by Anandita Das Bhattacharjee, Shroff Publishers
3. Artificial Intelligence – A Practical Approach : Patterson , Tata McGraw Hill, 3<sup>rd</sup> Edition

#### **Reference Books:**

1. Introduction to Artificial Intelligence – Charniak (Pearson Education)

**BECSE307T: Design Patterns**

| Load                                 | Credit | Total marks | Sessional marks | University marks | Total |
|--------------------------------------|--------|-------------|-----------------|------------------|-------|
| 4 hrs (Practical)<br>1 hr (Tutorial) | 5      | 100         | 20              | 80               | 100   |

UNIT – 1

Introduction to Design Patterns and Observer Pattern: Basics of Design patterns, Description of design patterns, Catalog and organization of catalog, design patterns to solve design problems, selection of design pattern, Use of design patterns.

UNIT - 2

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Creational Patterns

UNIT - 3

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion of Structural Patterns

UNIT - 4

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns

UNIT – 5

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation, Summary

UNIT – 6

Complexity Analysis of Design Patterns, Methods to analyze the complexity of design patterns, Implementation techniques and applications of design pattern in game design, product design,

TextBooks:

1. Head First Design Patterns, by Eric Freeman and Elisabeth Freeman
2. Design Patterns Explained, by Shalloway and Trott
3. Introduction to design Patterns in C++ with Qt by Alan Ezust, Paul Ezust

**BECSE307P: Design PatternsLab : Practical based on above syllabus using JAVA or .net**

| Load                 | Credit | Total marks | Sessional marks | University marks | Total |
|----------------------|--------|-------------|-----------------|------------------|-------|
| 2 hrs<br>(Practical) | 1      | 50          | 25              | 25               | 50    |

**Some Practicals based can be based Open Source Technology**

**BECSE309T:Software Engineering & Project Management**

| Load                                 | Credit | Total marks | Sessional marks | University marks | Total |
|--------------------------------------|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr (Tutorial) | 5      | 100         | 20              | 80               | 100   |

**UNIT – I**

**Introduction:** Software Characteristics, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

**UNIT – II**

**Software engineering Principles and Practice :**Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

**UNIT – III**

**System Analysis:** Structured Analysis, Data modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model, Design Concepts : Abstraction , Pattern modularity, Information hiding, Design classes, Refactoring.

**UNIT – IV**

**Software Testing:** Testing Fundamentals, Black-Box Testing, White-Box Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging.

**UNIT – V**

**Quality Management:** Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance. Quality concepts, Evolution of Quality Management, Quality assurance, Software reviews, Statistical quality assurance.

**UNIT – VI**

**Project management :** Introduction to Software Project Management, Project Planning, Project scheduling, Risk management , Change Management, Software reengineering, Restructuring Reverse engineering, Forward Engineering

**Text Books:**

1. Software Engineering-A Practitioner's Approach (Sixth Edition)-Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Summerville (Pearson Education)
3. Software Engineering: Theory and Practice (Fourth Edition – Pfleeger
4. Software Engineering- Mishra /Mohanty (Pearson Education)

**Reference Books:**

1. Software Engineering-Schaum's Series (TMH)
2. Software Project Management - Sanjay Mohapatra (Cengage Learning)
3. Quantitive techniques in project management by Rettyvellayudam

**BECSE310T: Computer Networks**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**UNIT-I**

Introduction to computer Networks, direction of data flow (simplex, Half duplex, full duplex); Networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN); Internet: brief history, internet today; Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

**UNIT-II**

**Physical Layer:** Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC;

**UNIT-III**

Point to point protocol, LCP, NCP, FDDI, token bus, token ring; Reservation, polling, concentration; Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, FDMA, TDMA, CDMA; Traditional Ethernet, fastEthernet;

**UNIT-IV**

Routing : techniques, static vs. dynamic routing , routing table for classful address; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing, Mobile routing basic algorithms.

**UNIT-V**

Protocols: ARP,RARP, IP, ICMP, IPV6; Unicast and multicast routing protocols. Congestion control algorithm: Leaky bucket algorithm, Token bucket algorithm, choke packets. Congestion control protocols.

**UNIT-VI**

Process to process delivery; UDP; TCP; Quality of service: techniques to improve Qos. ISDN services & ATM; DSL technology, Cable modem, Sonet. Wireless LAN: IEEE 802.11; Introduction to blue-tooth, VLAN's, Cellular telephony & Satellite network.

Text Books:

1. B. A. Forouzan – “Data Communications and Networking (3rd Ed.)” – TMH
2. A. S. Tanenbaum – “Computer Networks (4th Ed.)” – Pearson Education/PHI

3. W. Stallings – “Data and Computer Communications (8th Ed.)” – PHI/ Pearson Education  
Reference Books:

1. Kurose and Rose – “Computer Networking -A top down approach featuring the internet” – Pearson Education
2. Introduction to Data Communications and Networking by Wayne Tomasi-Pearson Edition
3. Comer – “Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.)” – Pearson Education/PHI

**BECSE310P: Computer Networks: Practical  
based on above syllabus.**

| Load                 | Credit | Total marks | Sessional marks | University marks | Total |
|----------------------|--------|-------------|-----------------|------------------|-------|
| 2 hrs<br>(Practical) | 1      | 50          | 25              | 25               | 25    |

**Practicals based on tools**

**1. Omnet**

**2. Castella**

**And JAVA, J2EE**

R.T.M.N.U Nagpur  
 Syllabus of B.E 6<sup>th</sup> Semester,  
 Computer Science Engineering

BECSE310T

**Functional English**

| Sr.<br>No. | Subject Code | Subject            | Workload |           |          |                | Credit  |           |          | Marks |                     |                             |                            |                |
|------------|--------------|--------------------|----------|-----------|----------|----------------|---------|-----------|----------|-------|---------------------|-----------------------------|----------------------------|----------------|
|            |              |                    | Lecture  | Practical | Tutorial | Total Hrs/Week | Lecture | Practical | Tutorial | Total | Theory<br>Sessional | Practica<br>l<br>University | Practica<br>l<br>Sessional | Total<br>Marks |
| 1          | BECSE310T    | Functional English | 2        | -         | 1        | 3              | 2       | -         | 1        | 3     | 10                  | 40                          | -                          | 50             |

Syllabus:

**Unit 1. Functional Grammar:** (4 Hours) ( 3+3+4=10)

Common errors , Transformation of Sentences, Phrases, Idioms & Proverbs. [ 50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs]

**Unit II. English for Competitive Exams & Interview Techniques:** (6 Hours) (3+3+4=10 )

IPA (vowel & consonant phonemes), Word building [ English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview Assignment :[ 25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for ]

**Unit III**

**(A) Formal Correspondence** (4 Hours) (5X2=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes [Orders, Complaints, Enquiries, Job applications & Resume Writing, Writing Memoranda]

**(B) Analytical comprehension:** (4 Hours)

[Four fictional & four non-fictional unseen texts]

**Unit IV. Technical & Scientific Writing:** (4 Hours) (5X2=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers. Assignment: ( Any one project/review as assignment)

**Total number of periods required = 22 for each Branch of Engineering**

**Reference Books:**

1. Effective technical Communication by Barun K. Mitra, Oxford University Press,
2. *Technical Communication-Principles and Practice* by Meenakshi Raman & Sharma, Oxford University Press, 2011, ISBN-13-978-0-19-806529-
3. *The Cambridge Encyclopedia of the English Language* by David Crystal , Cambridge University Press

4. *Contemporary Business Communication* by Scot Ober , Published by Biztantra,
5. *BCOM- A South-Asian Perspective* by C.Lehman, D. DuFrene & M. Sinha, Cenage Learning Pvt. Ltd.2012
6. *Business English*, by Dept of English, University of Delhi, Published by Dorling Kindersley (India), Pvt .Ltd.,2009, ISBN 978 81 317 2077 6
7. *How to Prepare a Research Proposal: Guidelines for Funding and Dissertations in the Social and Behavioral Sciences* by Krathwohl & R David
8. *Technical Writing- Process and Product* by Sharon J. Gerson & Steven M. Gerson, 3<sup>rd</sup> edition, Pearson Education Asia, 2000
9. *Developing Communication skills* by Krishna Mohan & Meera Banerjee

**EVALUATION PATTERN:**

Internal Examination: Weightage = 10 marks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

**Question pattern for end semester examination**

| Unit No           | Q. No                      | Question type                            | No. of Questions                               | Weightage |
|-------------------|----------------------------|--|--|-----------|
| Unit 1            | 1(A)<br>1(B)<br>1( C)      | objective<br>objective<br>objective      | 3 out of 5<br>3 out of 5<br>4 out of 6         | 3+3+4=10  |
| Unit 2            | 2 (A)<br>2(B)<br><br>2( C) | objective<br>objective<br><br>subjective | 3 out of 5<br>3 out of 5<br><br>1 ( no choice) | 3+3+4=10  |
| Unit 3 &<br>Unit4 | 3 (A)<br>3(B)              | Subjective<br>subjective                 | 1 set (out of 2 sets)<br>1(no choice)          | 5<br>5    |
| Unit 5            | 4(A)<br>4(B)               | subjective<br>subjective                 | 1 out of 2<br>1 out of 2                       | 5<br>5    |



## **VIII SEMESTER CSE**

### **BECSE406T: Distributed Operating System**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Fundamentals: Introduction, Models and Features, Concept of Distributed Operating system, Issues in Design of a Distributed Operating System.

Foundations of Distributed System: Limitations of Distributed Systems, Lamport's logical clocks, Vector clocks, Causal ordering of messages, Global state recording, Cuts of a Distributed Computation, Termination Detection.

**Unit II:** Distributed Mutual Exclusion: Requirement of Mutual Exclusion Algorithm, Non Token Based Algorithms: Lamport's Algorithm, Ricard-Agrawala Algorithm, Maekawa's Algorithm, Token Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Tree-Based Algorithm, Comparative Performance Analysis.

**Unit III:** Distributed Deadlock Detection: Introduction, Deadlock Handling strategies in Distributed System, Centralized and Distributed Deadlock Detection Algorithms.

Agreement protocols: Introduction, System Model, Classification of Agreement Problems, Solutions to the Byzantine Agreement Problem.

**Unit IV:** Distributed File system: Introduction to Distributed File System, Architecture, and Mechanism for Building Distributed File System.

Distributed Shared Memory: General Architecture of DSM systems, Algorithm for Implementing DSM, Memory coherence and Coherence Protocols.

**Unit V:** Distributed Scheduling: Introduction, Issues in Load Distributing, Components of a Load Distributing Algorithm, Load Distributing Algorithms: Sender-Initiated Algorithm, Receiver-Initiated algorithm, Symmetrically Initiated

Algorithm, Adaptive Algorithm, Requirements for Load Distributing Task Migration, Issues in Task Migration.

**Unit VI:** Failure Recovery: Recovery in concurrent systems, Consistent set of Checkpoints, Synchronous check pointing and Recovery, Asynchronous check pointing and Recovery.

Fault Tolerance: Introduction, Commit Protocols, Static Voting Protocol, Dynamic Voting Protocol.

**Text Books:**

1. Advanced Concepts in Operating Systems, Mukesh Singhal and Niranjan Shivaratri, Tata McGraw Hill, 2001.
2. Distributed Systems - Concepts and Design, Coulouris, Dollimore and Kindberg, 5th Edition, Addison-Wesley, 2012.

**Reference Books:**

1. Distributed Operating System, Andrew S. Tanenbaum, Pearson Education, 2003.

**BECSE406P: Distributed Operating System Lab**

| Load                 | Credit | Total marks | Sessional marks | University marks | Total |
|----------------------|--------|-------------|-----------------|------------------|-------|
| 2 hrs<br>(Practical) | 1      | 50          | 25              | 25               | 50    |

Practical based on the syllabus for the course **BECSE406T**.

## **BECSE407T: Information & Cyber Security**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Need of Information Security: Legal, Ethical and Professional Issues Attributes of security- authentication, access control, confidentiality, authorization, integrity, non-reproduction.

OSI Security Architecture: attacks, services and mechanisms. Security Attacks, Security services, A model of Internetwork Security.

Conventional Encryption: Classical Encryption Techniques and Problems on classical ciphers, Security architecture.

**Unit II:** Introduction to Secret key and cryptography, Encrypt given messages using DES, AES, IDEA, Problems on cryptography algorithms, Principles, finite fields, stream cipher, block cipher modes of operation, DES, Triple DES, AES, IDEA, RC5, key distribution.

**Unit III:** Introduction to Public key and Cryptography, Encrypt given messages using ECC, Problems on key generation, cryptography algorithms Principles, Introduction to number theory, RSA- algorithm, security of RSA, Key management- Diffie-Hellman key exchange, man-in-the-middle attack, Elliptical curve cryptography

**Unit IV:** Message Authentication and Hash Functions: Authentication Requirements and Functions, Hash Functions and their Security, MD5 Message Digest Algorithm, Kerberos.

Key Management: Digital Certificates-Certificate types, X.509 Digital Certificate format, Digital Certificate in action, Public Key Infrastructure-Functions, PKI Architecture, Certificate Authentication.

**Unit V:** Introduction to Network, Transport and Periphery Security, Study of IPSEC, TLS, and SSL. Firewalls - design principles, trusted systems, Intrusion Detection System, Intrusion Prevention System. Implementation and analysis of IPSEC, TLS and SSL, Introduction to cryptography - Classical cryptography.

**Unit VI:** Software Vulnerability: Phishing, Buffer Overflow, Cross-site Scripting (XSS), SQL Injection.

Electronic Payment: Payment Types, Enabling Technologies-Smart Cards and Smart Phones, Cardholder Present E-Transaction-Attacks, Chip Card Transactions, Payment over Internet-Issues and Concerns, Secure Electronic Transaction, Online Rail Ticket Booking.

Electronic Mail Security: Pretty Good Privacy, S/MIME

**Text Book:**

1. Cryptography and network security - principles and practices, William Stallings, Pearson Education, 2002.

**Reference Books:**

1. Network Security and Cryptography, Bernard Menezes, Cengage Learning.
2. Information System Security, Nina Godbole, Wiley India, 2008.
3. Network security, private communication in a public world, Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall, 2002.
4. Security architecture, design deployment and operations, Christopher M. King and Curtis Patton, RSA press, 2001.
5. Network Security - The Complete Reference, Robert Bragg and Mark Rhodes, Tata McGraw Hill, 2004.

**BECSE407P: Information & Cyber Security Lab**

| Load                 | Credit | Total marks | Sessional marks | University marks | Total |
|----------------------|--------|-------------|-----------------|------------------|-------|
| 2 hrs<br>(Practical) | 1      | 50          | 25              | 25               | 50    |

Practical based on the syllabus for the course **BECSE407T**.

**BECSE408T: Elective-III: Pattern Recognition**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction: Pattern Recognition Systems, Design Cycle, Applications of pattern recognition, Learning and Adaption-Supervised, Unsupervised and Reinforcement Learning.

**Unit II:** Probability: Introduction to Probability, Probability of events, Random variables, Probability Distributions, Joint Distribution and Densities, Moments of Random Variables, Estimation of Parameters from samples, Minimum Risk Estimators.

**Unit III:** Statistical Decision Making: Bayes' Decision Theory, Multiple Features, Conditionally Independent Features, Decision Boundaries, Unequal costs of Error, Estimation of Error Rates, Leaving-one-out Technique, Confusion Matrix, Characteristic Curves.

**Unit IV:** Classifiers: Hidden Markov Model, Support Vector Machine, Artificial Neural network-back Propagation Algorithm and Fuzzy based classifiers.

**Unit V:** Non Parametric Decision Making: Introduction, Histograms, Kernel and window Estimators, Nearest Neighbor classification Technique, Adaptive Decision Boundaries, Adaptive Discriminate Functions, Minimum Squared Error Discriminate Functions.

**Unit VI:** Clustering: Introduction, Hierarchical clustering, Partitional Clustering.

**Text Book:**

1. Pattern Recognition and Image Analysis, Earl Gose, Richard Johnsonbaugh and Steve Jost, PHI, 1996.

**Reference Book:**

1. Pattern Classification, Richard O Duda, Peter E. Hart and David G. Stork, John Wiley, 2000.

**BECSE408T: Elective III: Soft Computing Techniques**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction to Neuro: Fuzzy and Soft Computing: Soft Computing Constituents and Conventional AI; Neuro-Fuzzy and Soft Computing Characteristics.

Fuzzy Sets: Introduction Set Theoretic Operations, MF Formulation and Parameterization, Fuzzy Union, Intersection and Complement.

Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy If-Then Rules; Fuzzy Reasoning.

**Unit II:** Fuzzy Inference Systems: Mamdani Fuzzy Models; Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Other Considerations.

Derivative-Free Optimization: Introduction, Genetic Algorithms; Simulated Annealing; Random Search, Downhill Simplex Search.

**Unit III:** Adaptive Networks: Introduction, Architecture; Feed-forward Network; Extended Back-propagation for Recurrent Networks; Hybrid Learning Rule. Supervised Learning Neural Networks, Perceptrons, Back-propagation Multi-layer Perceptrons, Radial Basis Function Networks.

**Unit IV:** Unsupervised Learning and Other Neural Networks: Competitive Learning Networks, Kohonen Self-Organizing Networks; Learning Vector Quantization; Hebbian Learning, Principal Component Networks, Hopfield Networks.

**Unit V:** Adaptive Neuro-Fuzzy Inference System: ANFIS Architecture, Hybrid Learning Algorithm, ANFIS as Universal Approximator.

Data Clustering Algorithms: K-Means Clustering; Fuzzy C-Means Clustering, Mountain Clustering Method; Subtractive Clustering.

**Unit VI:** Rulebase Structure Identification: Input Selection, Input Space partitioning, Rulebase Organization, Focus Set-based Rule Combination.

**Applications:** Printer Character Recognition, Hand-written Numeral Recognition, GA-based Fuzzy Filters.

**Text Books:**

1. Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence; Jyh-Shing Roger Jang, Chuen-Tsai Sun and Eiji Mizutani; Prentice Hall, 2004.
2. Artificial Intelligence and Soft Computing, Anindita Das, Shroff Publication.

**Reference Books:**

1. Fuzzy Logic with Engineering Applications; Timothy J. Ross; McGraw-Hill; 1997.
2. Genetic Algorithms: Search, Optimization and Machine Learning; Davis E. Goldberg; Addison Wesley; 1989.
3. Neural Networks, Fuzzy Logic and Genetic Algorithms; S. Rajasekaran and G. A. V. Pai; Prentice Hall of India; 2003.

### **BECSE408T: Elective III: Optimization Techniques**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction: Engineering applications of optimization. Design variables. Constraints, objectives function, variable bounds, statement and formulation of an optimization problem, Example of Optimization problems, classification of optimization problems, different optimization algorithms.

**Unit II:** Optimal Point: Local optimal point, global optimal point and inflection point.

**Unit III:** Single Variable Optimization Techniques: Optimality criterion, Bracketing method (Bounding phase method), Region elimination methods (Internal halving method, Golden section search method), Point estimation method (successive quadratic estimation methods), Gradient-based methods (Newton-Raphson method, Bisection method, secant, Cubic search method.), Root finding using optimization techniques.

**Unit IV:** Multivariable Optimization Techniques: Optimality criterion, Unidirectional search method, Direct Search method (Hooke-Jeeves Pattern Search method, Powell's conjugate direction method), Gradient-based methods (Steepest descent method, Newton's method, and Marquardt's methods)

**Unit V:** Constrained Optimization Algorithms: Kuhn-Tucker conditions, Transformation method (Penalty function method), direct search for constrained minimization (variable elimination method, complex search method)

**Unit VI:** Linear Programming: Linear programming problems, Simplex method of linear programming techniques.

#### **Text Book:**

1. Optimization for Engineering Design: Algorithms and Examples, Kalyanmoy Deb, PHI Learning, 2004.

**Reference Books:**

1. Engineering Optimization: Theory and Practice, Singiresu S. Rao, John Wiley 2009.
2. Optimization of Chemical Processes, T.I. Edgar & D.M. Himmelblau, McGraw Hill.
3. Optimization: Theory and Practice, Beveridge and Schechter, McGraw Hill.

**BECSE408T: Elective III: Clustering & Cloud Computing**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction to Cloud Computing: Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Properties, Characteristics & Disadvantages of Cloud Computing, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing. Legal issues when using cloud models, challenges in cloud computing, Overview of Mobile Cloud.

**Unit II:** Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Infrastructure as a Service (IaaS)using OpenStack/OwnCloud.

**Unit III:** Big Data Analysis, Hadoop and Map Reduce: Introduction, Clustering Big Data, Classification of Big Data, Hadoop MapReduce Job Execution, Hadoop scheduling, Hadoop cluster setup, configuration of Hadoop, starting and stopping Hadoop cluster.

**Unit IV:** Security in Cloud: Cloud Security Challenges, Infrastructure Security, Network level security, Host level security, Application level security, data privacy, data security, application security, virtual machine security, Identity Access Management, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

**Unit V:** Application Development using C#: Understand object oriented concepts in C#.NET, Creation of UI and event handling, web page creation using ASP.NET, ADO.NET architecture, implementation of data sets, using ADO.NET in console application, using ADO.NET in web application.

**Unit VI:** Creating Cloud Application using Azure: Creating simple cloud application, configuring an application, creating virtual machine, deployment of application to Windows Azure Cloud, using Azure Storage Services, using Azure Table Service, deployment of application to the production environment.

**Text Books:**

1. Google Compute Engine, Mark Cohen and K. Hurley, O'Reilly, 2014.
2. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011
3. Cloud Computing, A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2014.
4. Microsoft Azure: Enterprise Application Development, R. J. Dudley and N. A. Duchene, SPD Publication.

**Reference Books:**

1. Cloud Computing using Windows Azure, B. M. Harwani, SPD Publication.
2. Cloud Computing, Implementation, Management and Security, J. W. Rittinghouse and J. F. Ransome, CRC Press.

**BECSE409T: Elective IV: Advanced Wireless Sensor Networks**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I: Introduction to Sensor networks:** application Examples of available sensor nodes, Challenges for WSN's, Mobile ad hoc networks and wireless sensor networks, single node architecture. Sensor node hardware overview, Sensors and actuators, Energy consumption of sensor nodes

**Unit II: Operating systems and execution environments:** Programming paradigms and application programming interfaces, Structures of operating system and protocol stack. Dynamic energy and power management, TinyOS and neSc examples

**Unit III: Network Architecture:** Sensor network scenarios, Design principles for WSNs, Services interfaces of WSNs, Gateway concepts, Mac protocols: Fundamentals, Low duty cycle and Wakeup concepts, contention and schedule based protocols, IEEE 802.15.4 MAC Protocol.

**Unit IV: Naming and Addressing:** Fundamentals Address and Name management in WSN, assignment in MAC Addresses, content based and geographical addressing. Hierarchical networks by clustering, Adaptive node activity: geographic adaptive Fidelity (GAF).

**Unit V: Routing protocols and content based** networking: Broadcast and multicast protocols Geographic Routing, Mobile nodes, Data centric Routing, Distribution versus gathering of data-In-network processing, Data Aggregation, data centric storage.

**Unit VI: Application specific support:** Advanced in-network processing, security, Target detection and tracking, contour/edge detection.

**Text Books:**

1. Protocols and Architectures for Wireless Sensor Networks, Holger Karl, and Andreas Willig, Wiley, 2005.
2. Wireless Sensor Networks, Cauligi S. Raghavendra, Krishna Sivalingam and Taieb M. Znati, Springer, 2005.
3. Introduction to Wireless and Mobile Systems, Third edition, Dharma Prakash Agrawal and Qing-An Zeng, Thomson/Cengage Learning, 2010.

**Reference Books:**

1. Wireless and Personal Communications Systems, Vijay K. Grag and Joseph E. Wilkes, Prentice Hall, 1995.
2. Routing in the Internet, Christian Huitema, Prentice Hall, 1995.

## **BECSE409T: Elective IV: Digital Image Processing**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction: What is Digital Image Processing, Applications of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of Image Processing System.

Digital Image Fundamentals: Elements of Visual Perception, Image Sampling and Quantization, Basic Relationships between Pixels.

Intensity Transformations: Basic Intensity Transformation Functions, Piecewise-Linear Transformations.

**Unit II:** Spatial Filtering: Histogram Processing – Histogram Equalization, Histogram Specification, Using Histogram Statistics for Image Enhancement, Fundamental of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Color Image Processing: Color Fundamentals, Color Models – RGB Model, CMY and CMYK Model, HSI Model, Pseudo-color Image Processing – Intensity Slicing, Intensity-to-Color Transformations.

**Unit III:** Filtering in Frequency Domain: Preliminary Concepts, Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of 2-D DFT, Basics of Filtering in Frequency Domain, Image Smoothing using Frequency Domain Filters, Image Sharpening using Frequency Domain Filters; Selective Filtering.

**Unit IV:** Image Restoration and Reconstruction: Model of Image Degradation/Restoration Process, Noise Model, Restoration in the Presence of Noise only – Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position Invariant Degradations, Inverse Filtering, Wiener Filtering; Constrained Least Squares Filtering, Geometric Mean Filter.

**Unit V:** Image Compression: Fundamentals – Coding Redundancy, Spatial-Temporal Redundancy, Measuring Image Information, Fidelity Criteria, Image

Compression Models, Basic Compression Methods – Huffman Coding, Arithmetic Coding, Run-length Coding, LZW Coding; Digital Image Watermarking.

**Unit VI:** Image Segmentation: Point, Line and Edge Detection – Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection, The Marr-Hildreth Edge Detector, The Canny Edge Detector, Edge Linking and Boundary Detection; Thresholding – Basic Global Thresholding, Otsu's Method; Region-Based Segmentation – Region Growing, Region Splitting and Merging.

Representation and Description: Boundary Following; Chain Codes; Polygonal Approximations using MPP; Signatures; Skeletons; Shape Numbers; Topological Descriptors.

**Text Books:**

1. Digital Image Processing; Rafael C. Gonzalez and Richard E. Woods; Third Edition; Pearson Education (India); 2014.
2. Digital Image Processing and Analysis; B. Chanda and D. Dutta Majumdar; Prentice Hall of India, 2001.
3. Digital Image Processing; S. Jayaraman, S. Essakkirajan and T. Veerakumar; Tata McGraw Hill; 2009.

**Reference Books:**

1. Digital Image Processing and Computer Vision; Milan Sonka, Vaclav Hlavac and Roger Boyle; Cengage Learning; 2008.
2. Digital Image Processing; Kenneth R. Castleman; Pearson Education (India); 1996.
3. Fundamentals of Digital Image Processing; Anil K. Jain; PHI Learning; 2013.

## **BECSE409T: Elective IV: Natural Language Processing**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction: NLP tasks in syntax, semantics, and pragmatics, Key issues & Applications such as information extraction, question answering, and machine translation, the problem of ambiguity, the role of machine learning, brief history of the field.

**Unit II:** N-gram Language Models : Role of language models, Simple N-gram models, Estimating parameters and smoothing, Evaluating language models, Part Of Speech Tagging and Sequence Labeling Lexical syntax, Hidden Markov Models, Maximum Entropy models.

**Unit III:** Syntactic parsing: Grammar formalisms and tree banks, Efficient parsing for context-free grammars (CFGs), Statistical parsing and probabilistic CFGs (PCFGs), Lexicalized PCFGs.

**Unit IV:** Semantic Analysis: Lexical semantics and word-sense disambiguation, Compositional semantics, Semantic Role labeling and Semantic Parsing.

**Unit V:** Information Extraction (IE): Named entity recognition and relation extraction, IE using sequence labeling, automatic summarization Subjectivity and sentiment analysis.

**Unit VI:** Machine Translation (MT): Basic issues in MT, Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

### **Text Books:**

1. Speech and Language Processing, D. Jurafsky and R. Martin, 2nd edition, Pearson Education, 2009.
2. Language Implementation Patterns, Terence Parr, Pragmatic Programmers, 2010.

**Reference Books:**

1. Natural Language Understanding, Allen James, Second Edition, Benjamin/Cumming, 1995.
2. NLP: A Paninian Perspective, Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, New Delhi, 1994.

## **BECSE409T: Elective IV: Digital Forensics**

| Load                                    | Credit | Total marks | Sessional marks | University marks | Total |
|---|--------|-------------|-----------------|------------------|-------|
| 4 hrs<br>(Theory)<br>1 hr<br>(Tutorial) | 5      | 100         | 20              | 80               | 100   |

**Unit I:** Introduction & evidential potential of digital devices – Key developments, Digital devices in society, Technology and culture, Comment, Closed vs. open systems, evaluating digital evidence potential. Device Handling & Examination Principles: Seizure issues, Device identification, Networked devices, Contamination, Previewing, Imaging, Continuity and hashing, Evidence locations.

**Unit II:** A seven element security model, A developmental model of digital systems, Knowing, Unknowing, Audit and logs, Data content, Data context. Internet & Mobile Devices, The ISO / OSI model, the internet protocol suite, DNS, Internet applications, Mobile phone PDAs, GPS, Other personal technology.

**Unit III:** Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources / Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence?, Case Histories, Case Studies.

**Unit IV:** Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised, Internet Tracing Methods.

**Unit V:** Homeland Security Systems, Occurrence of Cyber Crime, Cyber Detectives, Fighting Cyber Crime with Risk Management Techniques, Computer Forensics Investigative Services, Forensic Process Improvement, Case Histories.

**Unit VI:** The violation of privacy during information words. The individual exposed. Advanced computer Forensics systems and future directions- advanced, encryption, hacking, advanced trackers, case studies.

**Text Books:**

1. Digital Forensics, Angus M. Marshall, 2nd Edition, Wiley-Blackwell, John Wiley and Sons, 2008.
2. Computer forensics: Computer Crime Scene Investigation, John R. Vacca, 2nd Edition, Charles River Media, 2002.

**Reference Books:**

1. Recovering and examining computer forensic evidence, Michael G. Noblett; Mark M. Pollitt and Lawrence A. Presley, 2000.
2. A Formalization of Digital Forensics, R Leigland, 2004.
3. Evaluating Commercial Counter-Forensic Tools, M. Geiger, DFRWS-2005.
4. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Albert J. Marcella and Robert S. Greenfield, Auerbach Publications, 2007.
5. Handbook of Computer Crime Investigation: Forensic Tools and Technology, Eoghan Casey, Academic Press, 2001.
6. Privacy Protection and Computer Forensics, Second Edition, Michael Caloyannides, Artech House, 2004.
7. Computer Forensics: Incident Response Essentials, Warren G. Kruse and Jay G. Heiser, Addison Wesley, 2001.

**SYLLABUS Of**  
**Second & Fourth Semester Choice Base**  
**Credit System (CBCS)**  
**Of Master of Technology (M.Tech)**

**In**  
***Computer Science and Engineering***  
**(CSE) Of**  
**RASHTRASANT TUKDOJI MAHARAJ**  
**NAGPUR UNIVERSITY, NAGPUR**

## M. Tech. (CSE) II Semester

| Course Code | Course                 | Teaching Scheme |     | Credits |
|-------------|------------------------|-----------------|-----|---------|
|             |                        | Hours Per Week  | L P |         |
| PGCSE201T   | Advances in Algorithms | 4               | -   | 4       |

UNIT- I : **Algorithm Analysis:** Asymptotic Notation, Amortization, **Basic Data Structure:** Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tables **Search Trees and Skip Lists:** Ordered Dictionaries and binary Search Trees, AVL trees, Bounded-Depth Search Trees. Exposure to some advanced data structures- Fibonacci heaps, augmented data structures, interval trees, dynamic trees.

UNIT-II : **Fundamental Techniques:** The Greedy Method, Divide and Conquer, Dynamic Programming **Graphs:** The Graph abstract data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs. Graph algorithms: all-pairs shortest paths.

### UNIT-III

**Weighted Graphs:** Single Source Shortest Paths, All pairs Shortest Paths, biconnected components in undirected graphs, strongly connected components in directed graphs, and other problems, Minimum Spanning Trees Network **Flow and Matching:** Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum Cost Flow

## UNIT-IV

**Text processing:** Strings and Pattern Matching algorithms, Tries, Text Compression, Text Similarity testing. **Number Theory and Cryptography:** Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols.

## Unit-V

Exposure to following topics: Approximation algorithms, Algebraic and number theoretic algorithms, Computational Geometry. Linear programming, Parallel/distributed algorithms, Randomized algorithms.

## Reference Books

1. M.T.Goodrich, R.Tomassia, "Algorithm design – Foundations, Analysis, and Internet Algorithms", John Wiley, 2002
2. E Horowitz, S salmi, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, University Press, 2007
3. Aho, A V Hopcraft Ullman JD, "The Design and analysis of computer Algorithms", Pearson Education, 2007
4. Hari Mohan Pandey, " Design analysis amd Algorithms", University Science Press, 2009
5. Cormen, Lieserson, Rivest, "Introduction to Algorithms", 2nd Edition, PHI, 2003

| Course | Course | Teaching |
|--------|--------|----------|
|--------|--------|----------|

| <b>Code</b>      | <b>Advances<br/>Computer<br/>Network<br/>and<br/>Security</b> | <b>Scheme</b>             |          |                |
|------------------|---|---------------------------|----------|----------------|
|                  |   | <b>Hours<br/>Per Week</b> |          | <b>Credits</b> |
|                  |   | <b>L</b>                  | <b>P</b> |                |
| <b>PGCSE202T</b> |   | 4                         | -        | 4              |

### **UNIT I:**

TCP/IP architecture, IP v4 packet & addressing, Classfull & classless addressing, CIDR, Transition from IPv4 to IPv6, IPv6 packet & addressing, Load balancing in OSPF, EIGRP, HSRP, GLBP.

### **UNIT II:**

Optical Network, SONET, SONET Layers, SONET Frames, STS Multiplexing, Frame Relay, WWW, Wimax, GSM, UMTS, ATM, IP over ATM, VoIP, Real Time Transport Protocol: Scenario, Terminology, packet format.

### **UNIT III:**

Mobile IP, Mobile TCP, Dynamic DNS, Network Virtual Terminal, Remote Login: TELNET, SSH, NAT & PAT. Packages & Transition State: ARP, IP, ICMP, IGMP, UDP, TCP

### **UNIT IV:**

Symmetric Cipher model, Security Protocol: IPSec, SSL & TLS, Security in GSM & 3G, Differential & Linear cryptography, Euclidean Algorithm, Polynomial Arithmetic, Fermat's & Euler's Theorem, Elliptic Curve Cryptography & Arithmetic.

## **UNIT V**

Hash & MAC: Whirlpool, HMAC, CMAC, MD5, Digital Signature, X.500 & X.509v3, VPN, Trusted System, SAFER K & SK- 64/128, RADIUS & TACACS Server.

### **Text Books:**

1. Modern Operating Systems – A. S. Tanenbaum, Pearson Education
2. Data Communication & Networking – Behrouz Forouzan, Tata McGraw Hill
3. Cryptography & Network Security – William Stallings

### **Reference Books:**

1. Communication Network, Leon-Gracia, & Widjaja, 2001, TMH.
2. Cisco Routing & Switching Review Guide, Todd Lammle, Sybex

| <b>Course<br/>Code</b> | <b>Course</b>  | <b>Teaching<br/>Scheme</b> |            | <b>Credits</b> |
|------------------------|--|----------------------------|------------|----------------|
|                        |  | <b>Hours<br/>Per Week</b>  | <b>L P</b> |                |
| <b>PGCSE203T</b>       | <b>Advance<br/>Digital<br/>Image<br/>Processi<br/>ng</b> | 4                          | -          | 4              |

Unit-I

**Digital Image Fundamentals:** Simple image model, Fundamentals Steps in Image Processing, Elements of visual perception, image sensing and acquisition, Image Sampling and Quantization, Basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations, Introduction to 2D Fourier Transform and Liner Algebra. Fundamental operations of image processing using image processing tool.

Unit II

**Intensity Transformations and Filtering:** Spatial intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing filters, sharpening filters, fuzzy techniques for intensity transformations and spatial filtering. Frequency domain filtering- sampling and Fourier transform of sampled functions, Discrete Fourier transform, properties of DFT, smoothing and sharpening in frequency domain.

Unit III

**Color Image Processing and Wavelets:** Color models, intensity slicing, color transformations, fundamentals of wavelets- image pyramids, subband coding, Harr transform, multi-resolution expansion- series scaling and wavelet functions, 1D wavelet transform-wavelet series expansion, discrete wavelet transform, continuous wavelet transform, fast wavelet transform, 2D wavelet transform, wavelet packets .

Unit-IV

**Image Compression and Morphological Processing:** Image Compression fundamentals- coding redundancy, spatial and temporal redundancy, image compression models, image formats and compression standards, compression methods-Huffman coding, Golomb coding, Arithmetic coding, LZW, Run Length coding, wavelet coding, digital image watermarking, morphological operations- dilation, erosion, duality, opening, closing, hit/miss transformation, boundary extraction, hole filling, extraction of connected components, thinning, thickening, skeletons, pruning.

Unit V

**Image Segmentation and Object Recognition:** fundamentals, detection of isolated point, line and edge detection, edge linking and boundary detection, global thresholding basics, multiple thresholds, variable thresholding, multivariable thresholding, region growing, region splitting and merging, morphological watersheds- dam construction, watershed segmentation algorithm, markers, segmentation using motion- spatial techniques, frequency domain techniques. Patterns and patterns classes, matching, optimal statistical classifier, neural network, matching shape numbers, string matching.

### **Recommended Books :**

- 1.Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education.
- 2.A. K. Jain, "Fundamental of Digital Image Processing" PHI.
- 3.William Pratt, "Digital Image Processing", 4<sup>th</sup> Edition, Wiley India Edition.

| <b>Course Code</b> | <b>Course</b>   | <b>Teaching Scheme</b> |                |   |
|--------------------|---|------------------------|----------------|---|
|                    |   | <b>Hours Per Week</b>  | <b>Credits</b> |   |
| <b>PGCSE204/1T</b> | Elective -III<br>(Discipline)<br><br><b>Advance<br/>Multimedia<br/>System</b> | <b>L</b>               | <b>P</b>       |   |
|                    |   | 4                      | -              | 4 |

### **Unit I :**

Introduction to Multimedia Systems design, Elements, Systems architecture & technologies , Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression.

### **Unit II :**

Data and file format standards RTF, TIFF, RIFF, MIDI , JPEG , AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

### **Unit III :**

Telecommunications considerations for Multimedia, Specialized processors , ISDN, LAN and WAN for Enterprise Multimedia Applications, Distributed Object Model, Multimedia

communication protocols (UDP , RTP , RTCP , TELNET) ,Multimedia Applications and Design issues, Virtual Reality , Design, Components of Multimedia Systems,, Application Work flow & Distributed Application Design Issues

#### **Unit IV :**

Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access, Object display, Hypermedia Messaging, Integrated document Management

#### **Unit V :**

Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects , System Design: Design issues,requirements, feasibility, Performance Analysis, Design for performance , Multimedia Systems Design , Extensibility and example.

#### **BOOKS RECOMMENDED:**

- 1.Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
- 2.Fred Halsall," Multimedia Communications by (Pearson Publications).
- 3.Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
- 4.John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

#### **REFERENCE BOOKS:**

1. Game Engineering Design & Implementation - Alan Thorn, Pub : Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development : Chandler & Chandler, Pub : Jones & Bartlet (VIVA Pub.)

| <b>Course Code</b> | <b>Course</b>  | <b>Teaching Scheme</b> |            | <b>Credits</b> |
|--------------------|--|------------------------|------------|----------------|
|                    |  | <b>Hours Per Week</b>  | <b>L P</b> |                |
| <b>PGCSE204/2T</b> | Elective –III<br>(Discipline)<br><br><b>Internet of Things</b> | 4                      | -          | 4              |

### **Unit I IoT Web Technology**

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardisation, Recommendations on Research Topics.

### **Unit II IoT Applications for Value Creations**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT,

Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.

### **Unit III Internet of Things Privacy, Security and Governance**

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

### **Unit IV Architectural Approach for IoT Empowerment**

Introduction, Defining a Common Architectural Ground, IoT Standardisation, M2M Service Layer Standardisation, OGC Sensor Web for IoT, IEEE, IETF and ITU-T standardization activities, Interoperability Challenges, Physical vs Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardisation, Plan for validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.

### **Unit V Identity Management Models in IoT**

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.

## **Text Books**

1. Dr. Ovidiu Vermesan, Dr. Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013, ISBN: 978-87-92982-96-4 (E-Book), ISBN: 978-87-92982-73-5 (Print)
2. Dr. Parikshit Mahalle, Poonam Railkar, Identity Management for Internet of Thing, River Publishers, 2015, ISBN: 978-87-93102-91-0 (EBook), ISBN:978-87-93102-90-3(Hard Copy)

## **Reference Book**

1. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1

# **Foundation Course -I**

**PGIDC103T/PGPEPS103T**

## **ADVANCE CONTROL THEORY**

**(Common to M.Tech CBCS IDC and M.Tech CBCS PEPS)**

### **Course Objective:**

- To understand and analyse electromechanical systems by mathematical modeling.
- To Determine Transient and Steady State behavior of systems using standard test signals.
- To understand linear and non-linear systems for steady state errors, absolute stability and relative stability
- To Identify and design a control system satisfying requirements..

### **Course Outcomes:**

After the completion of this course, the students shall be able to:

- Develop mathematical models of physical systems.
- Design optimal controllers for physical systems including power electronic and power systems.
- Analyze the issues related to the stability of automatic control systems.
- Design complex nonlinear systems by linearizing them

### **Unit-I State Variable Analysis:**

Diagonalization of state model, Computation of STM by Laplace transform, Cayley Hamilton Theorem and Canonical transformation method, Solution of state equation. Controllability, Observability and state variable feedback.

### **Unit-II Digital Control Systems:**

Models of Digital control Devices, State description of Digital processors and sampled continuous time plants, discretization of digital continuous time state equations, Solution of state difference equation, Stability By Bilinear Transformation & Jury's Test.

### **Unit-III**

Controllability and observability tests for digital control systems, Stability of discrete time Systems, Pulse transfer function and its realization, Stability improvement by state feedback, Pole-placement design and state observers.

### **Unit-IV Lyapunov Stability Analysis:**

Basic concepts, Limit cycles, Stability definitions, Stability Theorems, Lyapunov functions for linear and non-linear systems.

### **Unit-VOptimal Control:**

Parameter optimization techniques, Lagrange parameter techniques, Calculus of variations, Unconstrained and Constrained minimization of functional, Two point boundary value problems, Pontrygin's minimum principle, Optimal regulator and tracking problems, Optimal digital control systems.

### **Reference Books**

1. M.Gopal.; Digital Control and State Variable Methods; Tata McGraw Hill, New Delhi, 1997.
  2. D.E. Kirk.; Optimal Control Theory; Prentice Hall, 1970.
  3. M.Gopal.; Digital Control Engineering; Wiley Eastern, 1988.
  4. B.C. Kuo.; Digital Control System Engineering; Saunders College publishing, 1992
- 
5. Advanced Control System ,First Edition, M. Rihan

## **PGIDC101T/PG IPS101T/PGPEPS 101T**

### **Advanced Power Electronics**

**(Common to M.Tech CBCS IDC, M.Tech CBCS PEPS and M.Tech CBCS IPS)**

#### **Course Objective:**

To understand the characteristics, capabilities, ratings, limitations and protection of various power semiconductor switches used for various Power Electronic applications.

To understand the performance and analysis of low frequency switched and high frequency switched AC to AC, DC to DC and DC to AC power electronic converters for various applications.

To understand various control schemes and soft switching techniques in industrial applications. Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric Drives an enabling technology.

Study and understand the different types of drives and selection of drive and power converter for particular application.

Study and understand the operation of electric motor drives controlled from a power electronic converter and to introduce the design concepts of controllers for closed loop operation.

Study and understand special motor drives and their control.

#### **Course Outcome:**

After the completion of this course, the students shall be able to:

Develop in depth knowledge of advanced power electronics devices.

Study, design and analyze the ac to ac converters.

Study, design and analyze dc to dc converters with their applications.

Understand and analyze various resonant and soft switching techniques for converters.

Study, design and analyze the dc to ac converters.

Understand the operation of modern power converters and multilevel inverters.

Understand the basic principles of power electronics in drives and its control, types of drives and basic requirements placed by mechanical systems on electric drives.

Understand the operation of 1 $\phi$  & 3 $\phi$  converter drives for separately excited & series DC motors.

Learn speed control of induction motor drives in an energy efficient manner using power electronics.

#### **Unit-I: Power Semiconductor Devices**

Characteristics, protection and industrial applications of power devices. Various pulse width modulation techniques for different converter topologies.

#### **Unit-II: AC-AC Converters**

Introduction, single and three-phase ac-ac voltage controllers, Cyclo-converter, Matrix converters, application of ac-ac converters.

### **Unit-III: DC-DC Converters**

Introduction, step-down converters- Buck, transformer version of buck converters, step up converters, Buck-Boost converters, application of dc to dc converters

### **Unit IV:- Resonant and soft switching converters**

Introduction, classification, resonant switch-ZC Resonant switch, ZV Resonant switch, Quasi resonant converters, multi resonant converters, load resonant converters and their applications.

### **Unit V:- DC-AC converters**

Introduction, classification, single-phase VSI (Half & Full Bridge), Three -phase VSI with SPWM, SVPWM, Selective harmonic elimination, SPWM with zero sequence signal injection with industrial applications.

#### **Text Books:**

1. “Power electronics handbook” by Muhammad Rashid , Academic Press.
2. “Modern Power Electronics” by P. C. Sen , A. H. Wheeler Publishing Co.
3. “Thyristorized Power Controller ” by Dubey , Joshi Doradla Sinha PHI Publication

#### **Reference Books:**

1. “Power Electronics” Cyril W Lander ,MHL
2. “Power Electronics”, Ned Mohan, Tora M. Udeland, William P. Robbins, John Wiley & sons
3. Related IEEE Papers / NPTEL Lectures.

**PGIPS104T/PGPEPS104T Elective I-(1)**

**Power System Dynamics and Control**

**(Common to M.Tech CBCS PEPS and M.Tech CBCS IPS)**

**Course Objective:**

- To provide in-depth understanding of operation of power flow studies in power system.
- To examine topical issues of stability study due to various faulty conditions.
- To enable students to analyze various types of methods to improve stability in integrated power systems.

**Course Outcome:**

- After the completion of this course, the students shall be able to,
- To understand short circuit and stability studies of components of power system.
- To understand controls for improvement in transient stability.
- To analyze the effects of various faults for multi machine systems.
- To understand the role of advanced technologies to improve transient stability.
- To study and analyze the Augmentation of stability

**Unit-I Representation of Power System:**

Elements like Synchronous machines, transformers, transmission lines, power semiconductor devices, loads, power system load flow, short circuit studies and power system stability studies using MATLAB-SIMULINK PSCAD, CAPS softwares.

**Unit-II Transient Stability Problem:**

Augmentation of Transient Stability by Discrete Supplementary Controls, Concept of resynchronization with discrete phase rotation for improvement in transient stability.

**Unit-III Fault analysis of large power systems:**

Transient stability – Review of classical methods, Dynamic and transient stability investigations and simulation of single machine infinite bus and multi-machine systems.

**Unit-IV**

**Transient stability** by step by step solution of swing equation, Euler's & modified Euler's method, Runga-kutta method, Transient state phasor diagram of synchronous machine. **Effects of various types of disturbances**, parameters and controls on stability, Effect of excitation control. Excitation system modeling, standard block diagram of excitation system.

## **Unit-V**

**Augmentation of stability** by conventional methods, second swing instability, problems on salient pole synchronous generator. Effect of turbine governor control, simple block diagram,

### **Text Books:**

1. Padiyar K.R.; Power System Dynamics, Stability and Control; B.S. Publications, Hyderabad 2002
2. Kimbark, E.W.; Power system stability, Vol. I & III, John Wiley & Sons, New York 2002  
Stagg G.W. & El-Abiad A.H.; Computer Methods in Power System Analysis, McGraw Hill Co., Ltd., Tokyo

## **PGIPS102T/PGPEPS102T**

### **Power System Modeling**

**(Common to M.Tech CBCS PEPS and M.Tech CBCS IPS)**

#### **Course objective:**

To analyze the modeling of long transmission line and compare the same with medium and short transmission line

To analyze the modeling of single phase transformer and three phase transformer per phase per unit basis.

To develop a simple but physically meaningful model of the synchronous machine.

To study load modeling w.r.t voltage & frequency point of view and acquire the knowledge of AC & DC excitation system

#### **Course Outcome:**

After the completion of this course, student will be able to,

Use Park's transformation and per unit system for simulation and stability analysis of power system.

Understand the general construction and relationship between the various fluxes and its impact on induced emf during the small and transient disturbances.

Understand the operational behavior and problems of two machine and multi-machine power system for stability study

To obtain the equivalent circuit, its parameters and simulation model for various components including loads in power system for static and dynamic stability studies.

Simulation and analysis of Dynamics of synchronous generator connected to infinite bus or multi machine power system.

To develop analytical approach and program tools for testing transition processes in power system.

Find equivalent pi model, sending and receiving end power using circle diagram, efficiency & regulation of long transmission line and compare the same with medium and short transmission lines.

Find effective inductance under open and short circuit condition, draw per phase equivalent circuit of

three-phase transformers and compare complex ideal transformers with simple ideal transformer. Analyze three phase armature currents, field current and different reactance's in d-q frame at different operating conditions.

Compare the static and dynamic loads and their performance at different frequencies and voltages.

Transform 3-phase quantities from a-b-c frame to d-q-o frame and vice-versa

## **UNIT-I: Synchronous Machine Modeling**

Description of a Synchronous Machine: Basic Synchronous Machine parameters, Voltage generation, Open-circuit voltage, Armature reaction, Terminal Voltage, Power delivered by generator.

## **UNIT-II: Synchronous Machine Modeling**

Per unit system and normalization: Equations of a synchronous machine: Stator circuit equations, Stator self, Stator mutual and stator to rotor mutual inductances, The Park's transformation, Flux-linkage equations, Voltage and current equations for stator and rotor in dq0 coordinates, Phasor representation, Steady state analysis, Transient & sub-transient analysis, Equivalent Circuits for direct and quadrature axes, Transient & sub-transient inductances and Time constants.

## **UNIT-III: Excitation and prime-mover controllers**

Excitation system, excitation system modeling, excitation system—standard block diagram, prime mover control system, examples.

## **UNIT-IV: Transmission line Modeling&Load Modeling**

Introduction, derivation of terminal V, I relations, waves on transmission lines, transmission matrix, lumped circuit equivalent, simplified models, complex power transmission (short line, radial line, long or medium lines).Basic load- modeling concept, static load models, dynamic load model, acquisition of load model parameters.

## **UNIT-V : Transformer modeling & the per unit system**

Introduction, single phase transformer model , three phase transformer connection , per phase analysis, p.u. normalization, p.u. three phase quantities, p.u. analysis of normal system , regulating transformer for voltage & phase angle control.

### **Text Books:**

1. Power System Analysis: Arthur R. Bergen, Vijay Vithal, Pearson Education Asia
2. Power System Control and Stability: Anderson P. M. and Fouad A. A., Galgotia Publications,(1981).
3. Generalized Theory of Machine: P. S. Bimbra, Vol. 2, Khanna Publishers (1987)
4. Power System Stability and Control: Kundur, P., McGraw Hill Inc., (1994).

### **Reference Books:**

1. Power System Dynamics, Stability and Control: Padiyar K. R., Interline Publishing Private Ltd., Banglore (1998).
2. Power System Analysis Operation and Control: 3<sup>rd</sup> ed., A. Chakrabarti, S. Halder, PHI, Eastern Economy Edition.

**PGOPEN 105T Open Elective II**

**Utilization of Electrical Energy**

**(Open Elective II from Electrical Engineering Board)**

**Course Objective:**

To understand the Illumination -Design of lighting scheme-sources of light  
To understand the Drives-Suitability for different applications  
To understand Electric Heating and Welding - Different methods.

**Course Outcome:**

To select their electric drive system based on application and availability of power source.  
Apply power electronics technology in efficient utilization of electrical heating  
Apply power electronics technology in efficient utilization of electrical welding  
Create lighting system using illumination fundamentals and various illumination Technologies.  
Analyze effective utilization of Power Electronic technologies in Electrical Traction.

**UNIT-I ELECTRIC DRIVES:**

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, Particular applications of electric drives, Types of industrial loads, continuous, Intermittent and variable loads, load Equalization.

**UNIT-II ELECTRIC HEATING:**

Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

**UNIT-III ELECTRIC WELDING:**

Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

**UNIT-IV ILLUMINATION FUNDAMENTALS & VARIOUS ILLUMINATION METHODS:**

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood ighting.

## **UNIT-V ELECTRIC TRACTION:**

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostatic braking and regenerative braking, Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves. Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

### **TEXT BOOKS:**

1. J.B. Gupta, “Utilization of Electric Power and Electric Traction”, Kataria & Sons publishers, Delhi, IX Edition, 2004.
2. C.L. Wadhwa, “Generation, Distribution and Utilization of electrical Energy”, New Age International (P) Limited Publishers, 3rd Edition, 2010.

### **REFERENCES:**

1. N.V. Suryanarayana, “Utilization of Electrical Power including Electric drives and Electric traction”, New Age International (P) Limited Publishers, 1st Edition,1994.
2. E. Open Shaw Taylor, “Utilization of Electric Energy”, Orient Longman,1st Edition,1937.

## **Advanced Electrical Drives**

### **Course Objectives:**

To understand various mechanical couplings, gears, flywheels used in drives and equivalent torque and inertia reflected on driving system.

To understand phase controlled and chopper controlled DC drives.

### **Course Outcomes:**

After the completion of this course, students shall be able to:

Select the suitable drive for drive system such as phase angle controlled, chopper-controlled dc drive depending upon its rating.

### **UNIT –I Dynamics of Electric Drives:**

Basic elements of an electric drives, Classification of electric drives, Stability consideration of electric drives.

### **UNIT-II: SINGLE-PHASE CONTROLLED RECTIFIERS FED DC MOTOR**

Separately excited DC motors with rectified single –phase supply – single-phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

### **UNIT-III: THREE-PHASE CONTROLLED RECTIFIERS FED DC MOTOR**

Three-phase semi converter and Three phase full converter for continuous and discontinuous modes of operations – power and power factor - Addition of Free wheeling diode – Three phase double converter. Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

### **UNIT-IV: CHOPPER CONTROLLED DC MOTOR DRIVES**

Principle of operation of the chopper – Four – quadrant chopper circuit – Chopper for inversion – Chopper with other power devices – model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque.

**Closed loop operation:** Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller.

### **UNIT-V: SIMULATION OF DC MOTOR DRIVES**

Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – command current generator – current controller.

## **REFERENCES:**

1. Power Electronics and motor control – Shepherd, Hulley, Liang – II Edition Cambridge University Press.
  2. Electronic motor drives modeling Analysis and control – R. Krishnan – I Edition Prentice Hall India.
  3. Power Electronics circuits, Devices and Applications – MH Rashid – PHI – 1 Edition 1995.
  4. Fundamentals of Electric Drives – GK Dubey Narosa Publishers 1995
  5. Power Semiconductor drives – SB Dewan and A Straughen -1975.
- 6.Bridges I. & Nasar S.A.; Electric Machine Dynamics Macmilan Publishing Company, NY,1986.
7. Krishnan, R.; Electric Motor Drives, Modelling, Analysis and Control; Prentice Hall India, 2003.

**PGIDC204T/PGIPS204T/PGPEPS204T Elective III-(1)**

## **Energy Audit and Management**

**(Common to M.Tech CBCS IDC , M.Tech CBCS PEPS and M.Tech CBCS IPS)**

### **Course Objective:**

To understand the present scenario of energy utilization, management and corresponding ACT of regulatory commission

To understand the process billing and power factor improvements to achieve energy efficient systems.

To understand role and responsibilities as energy auditors and energy manager in industrial applications.

### **Course Outcome:**

After the completion of this course, the students shall be able to,

An ability to develop in depth knowledge for energy balance and understand the various acts for the same

To carry out energy audits for optimal use of energy.

An ability to understand billing process for various industrial applications and selection of the factors for better utilization of energy.

Understand energy conservation in thermal power station.

Carry out performance analysis of electrical appliances and related case studies for improvement.

### **Unit-I- Energy Scenario:**

Present Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy Security, Energy Conservation and its Importance, Energy Conservation Act-2001 and its Features. Basics of Energy and its various forms, Material and Energy balance

### **Unit II- Energy Management & Audit:**

Definition, Energy audit- need, Types of energy audit, Energy management (audit) approach understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution, Energy audit Instruments energy management, Roles and responsibilities of energy Manager and Accountability, Financial analysis techniques, Financing options, Energy performance contracts and role of ESCOs. Defining monitoring & targeting, Elements of monitoring & targeting, Data and information-analysis, Techniques energy consumption, Production, Cumulative sum of differences.

**Unit III-Energy Efficiency in Electrical system:**

Electricity billing, Electrical load management and maximum demand Control, Maximum demand controllers; Power factor improvement, Automatic power factor controllers, efficient operation of transformers, Energy efficient transformers; Induction motors efficiency, motor retrofitting, energy efficient motors, Soft starters, Variable speed drives; Performance evaluation of fans and pumps, Flow control strategies and energy conservation opportunities in fans and pumps, Energy efficiency measures in lighting system, Electronic ballast, Occupancy sensors, and Energy efficient lighting controls. Factors affecting selection of DG system, Energy performance assessment of diesel conservation avenues

**Unit IV:-Energy Conservation in Thermal Systems:**

Types of boilers, Combustion in boilers, Performances evaluation, Feed water treatment, Blow down, Energy conservation opportunities in boiler, Properties of steam, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Identifying opportunities for energy savings. Classification, General fuel economy measures in furnaces, Excess air, Heat Distribution, Temperature control, Draft control, Waste heat recovery. Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria. Introduction, Mechanism of fluidized bed combustion, Advantages, Types of FBC boilers, Operational features, Retrofitting FBC system to conventional boilers, saving potential. HVAC system: Coefficient of performance, Capacity, Factors affecting Refrigeration and Air conditioning system performance and savings opportunities. Classification and Advantages of Waste Heat Recovery system, analysis of Waste heat recovery for Energy saving opportunities

**Unit V: Energy Performance Assessment:**

On site Performance evaluation techniques, Case studies based on: Motors and variable speed drive, Fans and pumps, HVAC system calculations; Lighting System: Installed Load Efficacy Ratio (ILER) method. Financial Analysis: simple payback period, NPV, IRR,

**Text Books:**

1. Handbook of Electrical Installation Practice. , By Geofry Stokes, Blackwell Science
2. Designing with light: Lighting Handbook., By Anil Valia, Lighting System
3. Energy Management Handbook., By W.C. Turner, JohnWiley and Sons

4. Handbook on Energy Audits and Management.Edited by Amit Kumar Tyagi, Tata Energy Research Institute (TERI).
5. Energy Management Principles., By C.B.Smith, Pergamon Press
6. Energy Conservation Guidebook., Dale R. Patrick, Stephen Fardo, Ray E.Richardson,Fairmont Press
7. Handbook of Energy Audits., By Albert Thumann,William J. Younger, Terry Niehus, CRC Press.

## **HVDC and FACTS**

### **(High voltage DC and Flexible AC Transmission System)**

**( Common to M.Tech CBCS PEPS and M.Tech CBCS IPS )**

#### **Course Objectives:**

- To understand basics of HVDC Systems.
- To understand convert control modes.
- To understand filtering harmonics and ripple.
- To enable the students to acquire a comprehensive knowledge on various aspects of FACTS systems.
- To develop ability to implement FACTS controller.

#### **Course Outcomes:**

- On completion of this course, the students shall be able to:
- Describe types of topology and multi terminal HVDC System
- Describe converter operation in various modes.
- Describe converter control modes
- Describe the application of filters to eliminates harmonics
- Analyse the fault in HVDC system and provide proper protection.
- Apply knowledge of FACTS controller to AC transmission system
- Apply shunt, series and their combination for compensation.
- Identify, formulate and solve network problems with FACTS controller.
- Understand the basic requirements in AC transmission and limitations of AC transmission systems.
- Understand the role of voltage, angle and impedance as important factors in AC power flow.
- Understand the operating characteristic of various FACTS controllers and their role on enhancing maximum power transfer capacity of power transmission systems.
- Understand the various methods of controlling voltage, angle and impedance in AC transmission system.
- Establish skill to model and analyze FACTS devices in power transmission system operation.
- Understand the causes, effects and remedies of power quality problems.

#### **Unit I: HVDC Technologies**

Developments in HVDC Technology, types of HVDC systems, equipments required for HVDC systems, comparison of HVDC system with AC systems in terms of technical performance, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC-VSC transmission systems.

#### **Unit II: Rectifier and Inverter of HVDC systems**

Rectifier and inverter operation, two valve, two/three valve, three/four valve operation, voltage current equations, control techniques of HVDC converter and systems.

#### **Unit III: Multi terminal HVDC system and FACTS**

Multi terminal HVDC systems:Types, parallel operation, operation and control, control of power, faults and protection. Multi terminal networks for non conventional power sources. Flexible AC Transmission System (FACTS): Their role in power system, types of FACTS controller, principle of series and shunt controllers.

#### **Unit IV: Shunt and series FACTS controllers**

Shunt controllers: Objectives, static switched capacitor, Thyristor controlled rectifier and STATCOM. Series controllers: Objectives, GTO thyristor controlled series capacitor, thyristor controlled series capacitor, thyristor controlled series compensators (TCSC), static synchronous series compensator (SSSC)

#### **Unit V: Other FACTS controller**

Working principle, control strategies and application of: Unified power flow controller (UPFC), interline power flow controller (IPFC)

#### **Text / Reference Books:**

1. S. Kamakshaiah, V. Kamaraju, "HVDC TRANSMISSION,"McGraw Hill Education (India) Private Limited, New Delhi, 2011
2. K. R. Padiyar, "HVDC POWER TRANSMISSION SYSTEMS,"New Age International Publishers, 2012
3. Narain G. Hingorani, Laszlo Gyugyi,"Understanding FACTS concept and technology of Flexible AC Transmission Systems,"IEEE PRESS, WILEY INDIA EDITION, 2000
4. K. R. Padiyar, "FACTS CONTROLLERS IN POWER TRANSMISSION AND DISTRIBUTION,"NEW AGE INTERNATIONAL PUBLISHERS, 2007

## **PGPEPS202T/PGIPS202T**

### **Power Quality**

**( Common to M.Tech CBCS PEPS and M.Tech CBCS IPS )**

#### **Course Objectives:**

- To introduce various power quality events.
- To introduce indices used for the analysis of power quality events.
- To introduce mitigation techniques for the improvement of power quality.
- To prepare student for analysis of power quality issues such as sag, flicker, harmonic distortion, unbalance, transients, etc.
- To introduce students with some power quality mitigating techniques
- To introduce the use power quality improvement methods.

#### **Course Outcomes:**

On completion of this course, the students shall be able to:

- Identify the various power quality events like short and long duration variations, Waveform distortion,
- Unbalance, Transients, Power factor etc.
- Analyze the power quality issues using the Power quality indices.
- Suggest suitable mitigation strategies for some of the power quality issues.
- Provide solution for the mitigation of power quality issues like waveform distortion, unbalance, and poor power factor.
- Analyze various power quality issues as sag, flicker, waveform distortion, unbalance, transients, etc.
- Suggest suitable mitigation strategies for some of the power quality issues
- Provide solution for the mitigation of power quality issues like harmonic distortion, unbalance, poor power factor.

#### **UNIT-1: Introduction**

Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Nonlinear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

#### **UNIT-2: Non Linear Loads**

Single phase / Three phase static converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

### **UNIT-3: Analysis and Conventional Mitigation Methods**

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On-line extraction of fundamental sequence components from measured samples – Harmonic indices.

### **UNIT-4 : Voltage Sag**

Analysis of voltage sag: Detroit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

### **UNIT-5: Power Quality Improvement**

Utility-Customer interface –Harmonic filters: passive,—Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC – control strategies: P-Q theory, Synchronous detection method – Custom power park – Status of application of custom power devices.

#### **Text books:**

1 Power Quality Enhancement Using Custom Power Devices 2002 Arindam Ghosh Kluwer Academic Publishers

2 Electric Power Quality 1994(2nd edition) G.T.Heydt Stars in a Circle Publications

3 Power Quality Edition (Year of publication) R.C. Duggan

#### **Reference books:**

1 Power system harmonics A.J. Arrillaga

2 Power electronic converter harmonics Derek A. Paice

# **PGFD205T Foundation Course -I**

## **Research Methodology**

### **Course objective:**

1. Introduction to philosophy of research.
2. Understand process to formulate research questions / idea
3. Understand process of planning of research time, resource
4. Understand different statistical analysis methods
5. Develop thesis and report writing.

### **Course outcome:**

1. Knowledge on various kinds of research questions and research designs
2. Formulate research problems (task) and develop a sufficiently coherent research design
3. Assess the appropriateness of different kinds of research designs
4. Knowledge on qualitative, quantitative and mixed methods of research, as well as relevant ethical and philosophical considerations
5. Develop independent thinking for critically analyzing research reports

### **Unit 1 Research Foundation**

What is Research, Objectives of Research, Types of Research, Scientific Research, Research and Theory, Conceptual and theoretical Models, Importance of research methodology in scientific research

### **Unit 2 Review of Literature**

Need for Reviewing Literature, What to Review and for what purpose, Literature Search Procedure, Sources of Literature, Planning of Review work, Note Taking, Library and documentation

### **Unit 3 Planning of Research**

The planning process , Selection of a Problem for Research, Formulation of the Selected Problems, Hypothesis formation, Measurement, Research Design/Plan

### **Unit 4 Processing of Data and Statistical Analysis of Data**

Introduction to Statistical Software, MINITAB, SPSS, Measures of Relationship, Simple Regression Analysis, Multiple Correlation and Regression, Partial Correlation, MATLAB and Neural Network based optimization, Optimization of fuzzy systems, Error Analysis, Results and their discussions

## **Unit 5 Report and Thesis writing**

Types of Reports, Planning of Report Writing, Research Report Format, Principles of Writing, Data and Data Analysis Reporting in a Thesis, Use of Endnote, Bibliography, API , appendix, table, Observations arrangement, Preparation of type script and lay-out of thesis, Use of LATEX Indexing of Journals, Impact factor and social Media for Researchers.

### **Reference Book:**

1. Research Methodology: Methods and Techniques by C. R. Kothari, New Age International Publishers, ISBN:81-224-1522-9
2. Statistical Methods for Research Workers by Fisher R. A., Cosmo Publications, New Delhi ISBN:81-307-0128-6
3. Design and Analysis of Experiments by Montogomery D.C. (2001), John Wiley, ISBN: 0471260088
4. MINITAB online manual
5. Methodology of Research in Social Sciences by O. R. Krishnaswamy and M. Rangnatham Himalaya publication House, 2005, ISBN: 8184880936
6. SPSS online manual

## **PGOPEN 301T Open Elective IV**

### **PLC & SCADA**

**(Open Elective IV from Electrical Engineering Board)**

#### **Course Objective:**

To understand the present scenario of energy utilization, management and corresponding ACT of regulatory commission

Students should understand the role of automation to make the distribution system more smart, reliable and efficient. They should correlate this aspect with required modern technology of PLC based components and SCADA.

Students should deal with the all inclusive role of SCADA and PLC in real time application.

#### **Course Outcome:**

Students will take part in all sorts of PLC system.

Students will be in condition to deal with the problems of PLC programming.

They will find out the real time schedule of operation of advanced PLC function.

Students will be in condition to deal with various PLC application.

They will handle the problems related with automation and SCADA

#### **Unit 01: Introduction to PLC**

Role of automation in Industries, benefits of automation, Necessity of PLC, History and evolution of PLC, Definition, types, selection criterion, Overall PLC system, PLC Input and output modules (along with Interfaces), CPU, programmers and monitors, power supplies, Solid state memory , advantages and disadvantages

#### **Unit 02: Programming of PLC**

Programming equipment, Various techniques of programming, Ladder diagram fundamentals, proper construction of ladder diagram, basic components and their symbols in ladder diagram, MCR (master control relay) and control zones, Boolean logic and relay logic Timer and counter-types along with timing diagrams, shift registers, sequencer function, latch instruction Arithmetic and logical instruction with various examples

#### **Unit 03: Advance PLC function**

Input ON/OFF switching devices, Input analog devices, Output ON/OFF devices, Output analog devices, programming ON/OFF Inputs to produce ON/OFF outputs. Analog PLC operation, PID control of continuous processes, simple closed loop systems, problems with simple closed loop systems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface, and Industrial process example.

## **Unit 04: Applications of PLC**

PLC interface to various circuits : Encoders, transducer and advanced sensors (Thermal, Optical, Magnetic, Electromechanical, Flow, Level sensors) Measurement of temperature, flow, pressure, force, displacement, speed, level Developing a ladder logic for Sequencing of motors, Tank level control, ON OFF temperature control, elevator, bottle filling plant, car parking Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable Frequency) AC motor Drive.

## **Unit 05: SCADA Systems:**

Introduction, definitions and history of Supervisory Control and Data Acquisition, typical SCADA system Architecture, Communication requirements, Desirable Properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA Architectures (First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture), SCADA systems in operation and control of interconnected power system, Power System Automation (Automatic substation control and power distribution ), Petroleum Refining Process, Water Purification System, Chemical Plant. Interfacing of SCADA with PLC.

### **Text Books:**

1. Gary Dunning, “Introduction to Programmable Logic Controllers”, Thomson, 2nd Edition
2. John R. Hackworth, Frederick D., Hackworth Jr., “Programmable Logic Controllers Programming Methods and Applications”, PHI Publishers
3. John W. Webb, Ronald A. Reis, “Programmable Logic Controllers: Principles and Application”, PHI Learning, New Delhi, 5th Edition
4. Ronald L. Krutz, “Securing SCADA System”, Wiley Publications.
5. Stuart A Boyer, “SCADA supervisory control and data acquisition”, ISA, 4th Revised edition
6. Sunil S. Rao, “Switchgear and Protections”, Khanna Publications.
7. L.A. Bryan, E. A. Bryan, “Programmable Controllers Theory and Implementation” Industrial Text Company Publication, Second Edition

**Reference books:**

1. Batten G. L., "Programmable Controllers", McGraw Hill Inc., Second Edition
2. Bennett Stuart, "Real Time Computer Control", Prentice Hall, 1988
3. Doebelin E. O., "Measurement Systems", McGraw-Hill International Editions, Fourth Edition, 1990
4. Gordan Clark, Deem Reynders, "Practical Modern SCADA Protocols", ELSEVIER
5. Krishna Kant, "Computer Based Industrial Control", PHI
6. M. Chidambaram, "Computer Control of Process", Narosha Publishing
7. P. K. Srivstava, "Programmable Logic Controllers with Applications", BPB Publications
8. Poppovik, Bhatkar, "Distributed Computer Control for Industrial Automation", Dekkar Publications
9. S. K. Singh, "Computer Aided Process Control", PHI
10. Webb J. W, "Programmable Controllers", Merrill Publishing Company, 1988

## **PGFD302T Foundation Course -II**

### **Project Planning and Management**

**Project Management (PM)** will provide students with the opportunity to gain a systematic and comprehensive understanding of key concepts and skills essential to project management in international affairs. By examining the project cycle using potential projects, students will learn techniques and tools used in formulating and managing projects and programs for desired impact.

By course end, students will be familiar with aid and development of project works, language and terminology used, different project structures, implementation practices, and strategies to address potential conflicts and obstacles. More importantly, students will have developed skills - strategic design, needs assessment, implementation, proposal and report writing, budgeting, monitoring and evaluation, advocacy, and others - that practitioners need to be effective in a range of professional contexts.

**Course Philosophy:** This is a course that will utilize learning techniques to provide students with opportunities to practice and process what they learn. This course attempts to cover skills that are relevant and current in international program work.

**Learning Objectives:** By course end students will be able to, within the above-stated limitations:

1. Conduct a basic needs assessment for a proposed project
2. Develop a project proposal
3. Develop a logical framework
4. Develop measurable indicators
5. Have ability to insert Monitoring and Evaluation into a project
6. Develop a grant proposal
7. Develop a project budget

As part of comprehensive preparation for the subject, by end of semester students will prepare an analytical and operational concept note that demonstrates:

1. Comprehensive understanding of the *context* in which they will work, including socio-political, economic, and cultural aspects.
2. Understanding of the *issue* they will work on, the causes, and its variations across contexts.
3. Strategies that have been used to tackle the problem(s) - the usual ones, and innovative ones. Students can introduce also other possible solutions worth exploring.

### **Benefits**

- Establish measures of success
- Quantify value commensurate with cost
- Optimize use of organizational resources
- Incorporate quality principles

- Put strategic plans into practice
- Ensure fast time-to-market Project Manager
- Reduced cost to deliver solutions
- Lower risk of slipping schedule
- Repeatable successes on projects
- Crisis prevention
- Early problem identification and risk mitigation
- Structured approach to Project Management
- More predictable results
- Improved resource productivity and satisfaction
- Project success that builds business success

## **Course Contents**

### ***Unit 1 : Basics of Project Management:***

Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Essentials of Project Management Philosophy, Project Management Principles

### ***Unit 2 : Project Identification and Selection:***

Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point ***Project Planning:*** Introduction, Project Planning, Need of Project Planning, Project Life Cycle, Roles, Responsibility and Team Work, Project Planning Process, Work Breakdown Structure (WBS) ***Organisational Structure and Organisational Issues:*** Introduction, Concept of Organisational Structure, Roles and Responsibilities of Project Leader, Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, Conflict Resolution, Team

### ***Unit 3: Resources Considerations in Projects:***

Introduction, Resource Allocation, Scheduling, Project Cost Estimate and Budgets, Cost Forecasts ***Project Risk Management:*** Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks

### ***Unit 4 : Project Quality Management and Value Engineering:***

Introduction, Quality, Quality Concepts, Value Engineering ***Project Management Information System:*** Introduction, Project Management Information System (PMIS), Planning of PMIS, Design of PMIS ***Purchasing and Contracting for Projects:*** Introduction, Purchase Cycle, Contract Management, Procurement Process

### ***Unit 5 : Project Performance Measurement and Evaluation:***

Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects ***Project Execution and Control:*** Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control ***Project Close-out, Termination and Follow-up:*** Introduction, Project Close-out, Steps for Closing the Project, Project Termination, Project Follow-up ***Project Management Software:*** Introduction, Advantages of Using Project Management Software, Common Features Available In Most of the Project Management Software, Project 2000.

### **Reference Books:**

1. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, by John W. Creswell, 2<sup>nd</sup> Edition , Sage Publication, 2003
2. Qualitative Inquiry and Research Design: Choosing among Five Approaches, by John W. Creswell, 3<sup>rd</sup> Edition , Sage publication, 2013.
3. Evaluation: A Systematic Approach, Peter H. Rossi, Mark W. Lipsey, and Howard E. Freeman, 7<sup>th</sup> edition , Sage publications, 2007.
4. Handbook of Practical Program Evaluation, Joseph S. Wholey, Harry P. Hatry, Kathryn E. Newcomer. 4<sup>th</sup> edition, Wiley, 2015
5. Program Evaluation and Performance Measurement: An Introduction to Practice, James C. McDavid and Laura R. L. Hawthorn, Sage Publication, 2013.
6. Evaluation, Carol H. Weiss, 2<sup>nd</sup> Edition, ABE books, 1997.
7. Case Study Research: Design and Methods, Robert K. Yin, 3<sup>rd</sup> Edition, Sage Publications, 2011

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**Appendix – 3**  
**Detailed Course Syllabus for MBA Program**  
**SEMESTER – I**

| Semester                          | I   | Course Code                           | 00 | Type of Course   | Core |
|-----------------------------------|---|---------------------------------------|----|--|------|
| Course Name                       | <b>INDUCTION cum FOUNDATION COURSE</b>  |                                       |    |  |      |
| Credits                           | None  | Number of 1 hour lectures:<br>Min. 40 |    | <b>4-8 hours per day</b>   |      |
| <b>Detailed Course Objectives</b> |   |                                       |    |  |      |
| CO1                               | Given a presentation/ debatable topic, discussion, training, the students will be able to <b>understand</b> voice modulation, nuances of diction and articulation which will in turn help them in <b>developing</b> effective communication skills.   |                                       |    |  |      |
| CO2                               | Given a workplace setting, the students will not only be <b>aware</b> about their inner qualities, inner potential and importance of human qualities but also will be able to <b>critically assess</b> the relationship between theory and practice in the formulation of values.   |                                       |    |  |      |
| CO3                               | The Students will be able to <b>perform</b> calculations based on elementary statistics and accountancy   |                                       |    |  |      |
| CO4                               | Given a stressful or demanding situation the students will <b>develop</b> skills like team work, leadership, time management and will also be able to develop self confidence, handle conflicts, be patient and work under pressure.  |                                       |    |  |      |
| CO5                               | Given a problematic situation/ a dilemma/ a choice the students will be able to <b>distinguish</b> between the ethical and unethical ways and <b>choose</b> the right way of doing things in professional and personal life.  |                                       |    |  |      |
| <b>Detailed Contents:</b>         |   |                                       |    | <b>Reference Book, Publisher, Edition, Page No.</b>  |      |
| Module 1                          | <b>Acting Techniques (Duration -2 hours)</b><br>Incorporates different renowned techniques which helps in understanding, analysing and applying the craft of Acting. History of Acting: traditional and classical modes of Acting, modern Acting i.e. method Acting / realistic form of Acting and the post-modern, i.e. contemporary methodologies, to comprehend the art of performance more efficiently.<br><b>Creative Body Movements (Duration -1 hours)</b><br>The body is the basic tool of an actor. Creative body movements are prime exercises, which |                                       |    | Drama Games and Acting Exercises: 177 games and activities, Rod Martin, 1 <sup>st</sup> Edition, Meriwether Publishing Ltd |      |

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|          | <p>are conducted in the beginning of almost every acting class. These movement classes enables one to become graceful and energetic, and makes one aware of factors like rhythm, gait, pace, tempo, gestures, postures, body language, compositions, etc. which later help one in understanding scenes more effectively.</p> <p><b>Voice Culture (Duration- 2 hours)</b></p> <p>The voice is another tool of an actor. In voice classes, students get to understand the power of their voice and gain an insight of how to modify it by controlling various resonators and muscles.</p> <p><b>Diction and Speech (Duration- 2 hours)</b></p> <p>The students are taught the importance of clarity of speech – articulation as well as expressions.</p>   |  |
| Module 2 | <p><b>Self Exploration</b>-what is it? Material requirement (tangible things) for the body and non-material requirement (intangible things) like love, respect, care, etc. Why are they important?</p> <p><b>Needs of Self (such) and Body (suvidha)-</b> trust love, care, respect (self), physical needs, facilities (suvidha); <b>Peer Pressure</b> and its effect on you and your family; <b>Seven Relations</b> - Parents-children (maataa &amp; pitaa { putra-putri}), Teacher { student (guru-shishya), Brother { sister (bhaii-behan), Friend (mitra), Saathi-sahayogi (leader-assistant at work place), Husband-wife (pati-patni), System related (Vyavasthaagata sambandh); <b>Nine Values</b> (Mulya) -Trust (Vishwas), Respect (Samman), Affection (Sneha), Care (Mamataa) Guidance (Vaatsalya) Gratitude (Kritagyataa) Reverence (Shraddha) Glory (Gaurav) Love (Prema)</p> | R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2   |
| Module 3 | <p>Basics of Business Statistics: Measures of Central Tendency – Mean, Mode, Median</p> <p>Basics of Accounting: Golden Principles of Accounting, Journal Entry, Ledger Posting, Trial Balance.</p> <p>Basics of Banking Transactions – Writing Bank Cheques, DD, Challan, Use of NEFT, RTGS, e-Wallets, UPI, Netbanking</p>   | <p><b>Statistical Methods</b>, S. P. Gupta, Sultan Chand &amp; Sons, ISBN-13: 978-8180549311 Chapter No. 7</p> <p><b>Financial Accounting</b>, S. N. Maheshwari, Suneel K Maheshwari, Sharad K Maheshwari, Vikas Publishing House; Sixth edition (2018), ISBN-13: 978-9352718535</p> |
| Module 4 | <p><b>Games and sports</b> - This would involve a daily routine of physical activity with games and sports. There can be games in the evening or at other suitable times according to the local climate. Each student should pick one game and learn it for the duration of the induction program and hopefully, continue with it later.</p> <p>The physical, psychological and social benefits of exercise and the importance of assuming</p>   | <a href="https://www.yogajournal.com">https://www.yogajournal.com</a>  |

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|-----------------------------------|---|---|
|                                   | <p>personal responsibility in lifestyle choices. Guidelines for healthy eating, the importance of good nutrition and physical activity in weight management and the problems associated with fad diets and quick weight-loss methods</p> <p><b>YOGA-</b> few basic asanas and some breathing techniques</p> <p><b>ZUMBA-</b> Zumba is a great confidence and a great way to relieve stress for all while having fun and getting in a great work out.</p> <ul style="list-style-type: none"> <li>• <b>Talk on Healthy eating habits</b> and Tips for leading a FIT lifestyle can be organized in association with the Sports Department</li> <li>• <b>Daily 15 minutes meditation</b> sessions can be organized for the benefit of the students.</li> </ul>  |   |
| Module 5                          | <p><b>Indian ethos and values-</b> relevance of Indian ethos, Indian work ethos and Principles of Indian ethos for Management, <b>Cultural influences on business practices-</b> benefits from the culture knowledge- culture insights into social responsibility, <b>Principles Practiced by Indian Companies,</b> Role of Indian Ethos in Managerial Practices, <b>Transactional Analysis- An Indian Perspective</b></p>  | <p><b>1. Indian Ethos and values in Management</b><br/>by R. Nandagopal by Ajith Sanakr R.NN, Tata Mc Graw Hill Education Pvt. ltd, New Delhi (Chapter One Page 2-22)</p> |
| Other Reference books and sources | <ol style="list-style-type: none"> <li>1. <a href="https://www.aicte-india.org/sites/default/files/induction-guide-jun17-aicte%20(1).pdf">https://www.aicte-india.org/sites/default/files/induction-guide-jun17-aicte%20(1).pdf</a></li> <li>2. The Theatre of the Absurd (English), Martin Esslin, Bloomsbury Publishing India Private Limited; ISBN-13: 978-1472577023</li> <li>3. The Theatre of the Absurd (Marathi), Dr. Satish Pawade, Generic, ASIN: B07RDY6LSZ</li> <li>4. Jagatik Rangabhoomi Purvarang by Manisk Kaned- Publication Rohan Prakashan</li> <li>5. Natyadarshan by Dr. Parag Ghonge by Sahitya Samiksha</li> <li>6. The Body Can Speak: Essays on Creative Movement Education with Emphasis on Dance and Drama, 1st Edition, by Annelise Mertz (Author), Joseph Roach (Foreword)</li> <li>7. Vacghik Abhinay by Dr. Shriram Lagoo</li> <li>8. <b>Lessons from Mahabharta</b> by G.N. Das, Abhinav Publishers, New Delhi, 1998</li> <li>9. <b>Indian Ethos and Values for Leadership Excellence</b> by K. Nagrajan, New Age International Publishers, 1st edition, 2011, (Chapter 9- Pg 103-113)</li> <li>10. Business Ethics and values By Dr. D. Senthil Kumar and A. Senthil Kumar , Himalaya Publishing House, 33rs edition, 2008(Chapter 7 pg no.283-295)</li> </ol> |   |

| Semester                          | I   | Course Code                | 1T1 | Type of Course                                      | Core   |  |  |  |
|-----------------------------------|---|----------------------------|-----|---|--|--|--|--|
| Course Name                       | <b>MANAGERIAL ECONOMICS</b>   |                            |     |   |  |  |  |  |
| Credits                           | 3   | Number of 1 hour lectures: | 30  |   |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                            |     |   |  |  |  |  |
| <b>CO1</b>                        | Given the details regarding price and quantity, the future manager will be able to <b>calculate</b> and <b>interpret</b> price elasticity, income elasticity and cross-price elasticity of demand and will also be able <b>examine</b> the uses and abuses of demand forecasting techniques   |                            |     |   |  |  |  |  |
| <b>CO2</b>                        | Given the information about scale of production, the future manager will be able to <b>analyze</b> various aspects of empirical production functions and also will be able to <b>comprehend</b> the difference sources of economies and diseconomies of scale.  |                            |     |   |  |  |  |  |
| <b>CO3</b>                        | Given the information pertaining to market structure, the future manager will be able to <b>determine</b> the optimal price and output for firms under different market structures.   |                            |     |   |  |  |  |  |
| <b>CO4</b>                        | Given the circular flow model of an economy, the future manager will be able to interpret the role and importance of each component with regard to factor market and product market and will also be able to <b>comment</b> on the implications and control of inflation.   |                            |     |   |  |  |  |  |
| <b>CO5</b>                        | Given the information regarding expenses and income in an economy, the future manager will be able to <b>calculate</b> and <b>explicate</b> the gross domestic product using expenditure and income approaches and given the details about a phase of the business cycle, the future manager will be able to <b>depict</b> the symptoms, causes and effects on economic activities of a nation. |                            |     |   |  |  |  |  |
| <b>Detailed Contents:</b>         |   |                            |     | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |  |
| <b>Module 1</b>                   | <b>DEMAND ANALYSIS:</b> Introduction; <b>Demand Analysis:</b> The Consumer, Demand Concepts, Own-Price Elasticity of Demand, Income Elasticity of Demand, Cross-Price Elasticity of Demand. Substitution and Income Effects. Normal and Inferior Goods. Indifference Curve Analysis. <b>Demand Forecasting:</b> Need, Techniques and Procedures   |                            |     |   | Managerial Economics: Analysis, Problems and Cases, P.L. Mehta, 13 <sup>th</sup> Edition, S. Chand & Co. Ltd. Chap 4, 5, 6 & 7 |  |  |  |
| <b>Module 2</b>                   | <b>SUPPLY AND PRODUCTION DECISIONS:</b> The Law of Supply, Theory of Production:  |                            |     |   | Managerial Economics: Analysis, Problems   |  |  |  |

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|-----------------------------------|--|--|
|                                   | Factors affecting production, production function, short run analysis, law of variable proportions, Isoquant Curves, Long run production function, Cobb-Douglas production function, Cost-Output Function, Economies and Diseconomies of Scale   | and Cases, P.L. Mehta, 13 <sup>th</sup> Edition, S. Chand & Co. Ltd. Chap 10 & 11  |
| Module 3                          | <b>MARKET STRUCTURES AND PRICING PRACTICES:</b> Introduction; <b>Analysis of Market Structures:</b> Factors That Determine Market Structure. <b>Perfect Competition:</b> Demand-supply Analysis in Perfectly Competitive Markets, Optimal Price and Output in Perfectly Competitive Markets. <b>Monopolistic Competition:</b> Demand-Supply Analysis in Monopolistically Competitive Markets, Optimal Price and Output in Monopolistically Competitive Markets, Factors Affecting Long-Run Equilibrium in Monopolistically Competitive Markets. <b>Oligopoly:</b> Demand-Supply Analysis and Pricing Strategies in Oligopoly Markets, Optimal Price and Output in Oligopoly Markets, Factors Affecting Long-Run Equilibrium in Oligopoly Markets. <b>Monopoly:</b> Demand-Supply Analysis in Monopoly Markets; Optimal Price and Output in Monopoly Markets, Price Discrimination. | Managerial Economics: Principles and Worldwide Applications, Dominick Salvatore and Ravikesh Shrivastava, 7 <sup>th</sup> Edition, Oxford Publications, Chap 8<br><br>Managerial Economics, D. N Dwivedi, 7 <sup>th</sup> Edition, Vikas Publications, Chap 13 |
| Module 4                          | <b>MACRO ECONOMIC FUNDAMENTALS:</b> Macro Economics – Meaning, Nature and Scope, Circular Flow Model of Economy. <b>Inflation:</b> Demand-Pull and Cost-Push Inflation, CPI vs. WPI, Causes, Effects and Remedies of Inflation, Theories of Inflation and Policy measures to control inflation   | Managerial Economics, D. N Dwivedi, 8 <sup>th</sup> Edition, Vikas Publications, Chap 23,24, 25 & 26   |
| Module 5                          | <b>NATIONAL INCOME AND BUSINESS CYCLE:</b> National Income – Concept and Measurement, Theory of National Income Determination – Multiplier and Accelerator Theories. <b>Overview of the Business Cycle:</b> Phases of the Business Cycle; Factors causing swings in business activity and measures to control business cycles.   | Managerial Economics: Analysis, Problems and Cases, P.L. Mehta, 13 <sup>th</sup> Edition,S. Chand & Co. Ltd.Chapter 20, 21 & 26  |
| Other Reference books and sources | <ol style="list-style-type: none"> <li>1. Ritika Sinha : "Managerial Economics", SBPD Publishing House</li> <li>2. Damodaran Suma: "Managerial Economics", Oxford University Press , 200</li> <li>3. Paul A Samuelson and William D Nordhaus : "Economics", McGraw Hill</li> <li>4. Geethika, Ghosh &amp; Choudary : "Managerial Economics", McGraw Hill.</li> </ol>   |  |

| Semester | I | Course Code | 1T2 | Type of Course | Core |
|----------|---|-------------|-----|----------------|------|
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|-----------------------------------|---|---|-----------|
| <b>Course Name</b>                | <b>MANAGEMENT INFORMATION SYSTEM</b>  |   |           |
| <b>Credits</b>                    | <b>3</b>  | <b>Number of 1 hour lectures:</b>   | <b>30</b> |
| <b>Detailed Course Objectives</b> |   |   |           |
| <b>CO1</b>                        | The student will be able to <b>describe</b> different types of management information system from management activity point of view and will also be able to <b>identify</b> and <b>work out</b> KRAs, BOPs and BPPs for various organisations/systems.         |   |           |
| <b>CO2</b>                        | The student will be able to <b>identify</b> the master data, <b>draw</b> report format and interface matrix while making a <b>model</b> of DSS.   |   |           |
| <b>CO3</b>                        | The student will be able to <b>suggest</b> the conceptual model of PMS and will also be able to <b>draw</b> a system model of integrated system (PMS+SCM+Accounting and Billing)  |   |           |
| <b>CO4</b>                        | The student will be able to <b>describe</b> the key features of ERP, SCM and CRM and will also be able to <b>draw</b> functional flow and process flow diagrams for various transactions.   |   |           |
| <b>CO5</b>                        | The student will be able to <b>enumerate</b> the factors affecting system performance and will also be able to <b>comment</b> on the operational feasibility of IT system under consideration   |   |           |
| <b>Detailed Contents:</b>         |   | <b>Reference Book, Publisher, Edition, Page No.</b>   |           |
| <b>Module 1</b>                   | Concepts & Types of Information Systems. Components of MIS. Information Activities. Strategic Management of Business. Balance Score Card, Scorecard and Dashboard, measures of business operations and business performance. Steps for strategic design of MIS. | Management Information Systems (1 <sup>st</sup> Edition) Giridhar Joshi, Oxford University Press Chap 1<br>Management Information Systems (4 <sup>th</sup> Edition) Waman S Jawadekar, McGraw Hill Publication, Chap 10 |           |
| <b>Module 2</b>                   | Applications of MIS in Manufacturing Sector: Model of Information Processing System. Application of Model to personnel management, financial management, production   | Management Information Systems (4 <sup>th</sup> Edition) Waman S Jawadekar, McGraw Hill   |           |

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|                 | management, marketing management.  | Publication, Chap 12   |
| <b>Module 3</b> | Introduction to Service Sector, creating distinctive service, service concept, service process cycle, service management system, MIS application in Service industry - banking & insurance   | Management Information Systems (4 <sup>th</sup> Edition) Waman S Jawadekar, McGraw Hill Publication, Chap 13 |
| <b>Module 4</b> | Enterprise Management System. ERP Systems, Models of business functions integration. ERP Model and Modules. Business organization model. ERP product characteristics. Benefits of ERP. ERP Product evaluation. ERP implementation. SCM & CRM. EMS Model. | Management Information Systems (4 <sup>th</sup> Edition) Waman S Jawadekar, McGraw Hill Publication, Chap 15 |
| <b>Module 5</b> | Technology of Information Systems. Introduction, data processing, Transaction processing, Application processing, information system process, OLAP, TQM of Information system. Real time systems. Case tools and I-CASE.                                 | Management Information Systems (4 <sup>th</sup> Edition) Waman S Jawadekar, McGraw Hill Publication, Chap 16 |

| Semester                          | I   | Course Code | 1T3                               | Type of Course | Core      |  |  |
|-----------------------------------|---|-------------|-----------------------------------|----------------|-----------|--|--|
| <b>Course Name</b>                | <b>BUSINESS RESEARCH</b>  |             |                                   |                |           |  |  |
| <b>Credits</b>                    | 3   |             | <b>Number of 1 hour lectures:</b> |                | <b>30</b> |  |  |
| <b>Detailed Course Objectives</b> |   |             |                                   |                |           |  |  |
| <b>CO1</b>                        | In context of research, the student will be able to <b>define</b> business research problems and will also able to formulate an abbreviated version of research proposal. |             |                                   |                |           |  |  |
| <b>CO2</b>                        | The student will be able to <b>describe</b> and <b>choose</b> appropriate sampling design and will also be able to <b>estimate</b> appropriate sample size.               |             |                                   |                |           |  |  |

| CO3                | The student will be able to develop measurement tools and construct appropriate scales therein.  |  |  |
|--------------------|--|--|--|
| CO4                | The student will be able to <b>select</b> suitable method of data collection and will be able to <b>make</b> questionnaire/e-questionnaire   |  |  |
| CO5                | The student will be able to <b>derive</b> inferences by applying various techniques of interpretation and be and write various types of research reports.  |  |  |
| Detailed Contents: |  |  |  |
| Module 1           | <b>Theory Building and Research Proposal</b> - Meaning and nature of Theory, Nature of proposition, Scientific Method, Verifying Theory, Inductive and Deductive Reasoning, Nature of business problem, importance of problem definition, the process of problem definition, research questions and research objectives, research proposal, anticipating outcomes, Literature Review |  |  |
| Module 2           | <b>Sampling Design</b> - Census and Sample Survey, Implication of Sample Design, Steps in Sample Design, Sampling Procedure, Different Types of Sampling Designs, How to select a random sample, Random sample from infinite universe, Sample size calculation.  |  |  |
| Module 3           | <b>Measurement and Scaling Techniques</b> - Measurement in research, Measurement Scales, Source of errors in measurement, Test for sound measurement, Techniques for developing measurement tools, Scaling - Meaning, Scale classification bases, Important Scaling Techniques, Scale construction techniques  |  |  |
| Module 4           | <b>Methods of Data Collection</b> - Collection of Primary Data (Observation, Interview, Questionnaire, Schedules), Other methods of data collection, Collection of Secondary Data (Reliability, Suitability and Adequacy), Selection of appropriate method for data collection, Constructing Questionnaire/e-questionnaire/Schedule  |  |  |
| Module 5           | <b>Interpretation and Report Writing</b> - Meaning and Techniques of Interpretation, Significance and Steps of Report Writing, Layout of research reports, types of reports, Mechanics and Precautions for writing a research report.  |  |  |
|                    | <ol style="list-style-type: none"> <li>1. Panneerselvam, "Research Methodology", Prentice Hall India</li> <li>2. Donald Cooper and Pamela Schindler, "Business Research Methods ", Tata McGraw Hill</li> </ol>   |  |  |

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|  | <p>3. Krishnaswami &amp; Rangantham, "Methodology of Research ", Himalaya Publishing House</p> <p>4. Alan Bryman and Emma Bell, "Business Research Methods ", Oxford Publication</p> |
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| Semester                          | I  | Course Code                | 1T4 | Type of Course                                      | Core   |  |  |  |  |
|-----------------------------------|--|----------------------------|-----|---|--|--|--|--|--|
| Course Name                       | <b>ORGANIZATIONAL BEHAVIOUR</b>  |                            |     |   |  |  |  |  |  |
| Credits                           | 3  | Number of 1 hour lectures: |     | 30  |  |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                            |     |   |  |  |  |  |  |
| CO1                               | Students will be able to <b>explain</b> the concept of Organisation Design and <b>determine</b> the factors that affect Organisation Design.   |                            |     |   |  |  |  |  |  |
| CO2                               | Students will be able to <b>identify</b> the components of Individual Behaviour and <b>apply</b> the concept of Learning, Perception, Attitudes and values.  |                            |     |   |  |  |  |  |  |
| CO3                               | The student will be able to <b>distinguish</b> between the various theories of motivation and their application in organizations and also be able to <b>apply</b> these theories to practical problems in organizations. They will also be able to <b>distinguish</b> between a number of different leadership theories & styles and contribute to the effective performance of a team as the team leader or a group member. |                            |     |   |  |  |  |  |  |
| CO4                               | The future managers/ students will be able to <b>analyse</b> the behaviour of individuals and groups in organisations in terms of the key factors that influence organisational behaviour and demonstrate skills required for working in groups (team building).   |                            |     |   |  |  |  |  |  |
| CO5                               | The students will be able to <b>justify</b> how organizational change and conflict affect working relationships within organizations and <b>demonstrate</b> how to apply relevant theories to solve problems of change and conflict within organizations   |                            |     |   |  |  |  |  |  |
| <b>Detailed Contents:</b>         |  |                            |     | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |  |  |
| Module 1                          | <b>Organisation Design:</b> Understanding organizations-Basics of an organizational design-Organization and stakeholders-Organizations and environmental influences-Organizational strategy-Organizational design - Alternative structures- <b>Management process</b> - Authority and Responsibility Relationship; organizational control mechanisms; Organizational decision making   |                            |     |   | Organisational Behavior - Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, 13 <sup>th</sup> Edition, , ISBN 978-81-317-2121-6, Chapter 16<br><br>Principles of Management, T. Ramaswamy, |  |  |  |  |

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|  |  | 1 <sup>st</sup> Edition, Himalaya Publishing House pvt Ltd. Chapter No. 7,8,11   |
| <b>Module 2</b>                          | <i>Organisational Behaviour:</i> Introduction, Foundations of individual behavior-Ability, Attitudes ,Job Satisfaction, Personality, Values , Perception   | Organisational Behavior - Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, 13 <sup>th</sup> Edition, ISBN 978-81-317-2121-6, Chapter 2,3,4&5   |
| <b>Module 3</b>                          | <b>Motivation-</b> Concept, types of motivation and Theories-Maslow, Herzberg,Mc Gregor. <b>Leadership-</b> Concept, Leadership styles and Theories- Trait Theory, Path Goal Theory, Blake Mouton-Managerial Grid  | Organisational Behavior - Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, 13 <sup>th</sup> Edition, ISBN 978-81-317-2121-6, Chapter 6,7,12&13 |
| <b>Module 4</b>                          | <b>Group and Team Behavior-Foundations of Group behavior</b> -Group development; Group properties: Roles, norms, status, size and cohesiveness, Group decision making, Techniques, <b>Teams-Type and Team Dynamics</b>   | Organisational Behavior - Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, 13 <sup>th</sup> Edition, ISBN 978-81-317-2121-6, Chapter 9&10      |
| <b>Module 5</b>                          | <b>Conflict and Change</b> -Understanding organizations- Managing organizational culture, Managing organizational conflict, power & politics ;Organizational life cycle and Organisational change  | Organisational Behavior - Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, 13 <sup>th</sup> Edition, ISBN 978-81-317-2121-6, Chapter 15&19     |
| <b>Other Reference books and sources</b> | <ol style="list-style-type: none"> <li>1. Organisational Behavior Text Cases and Games, K. Aswathappa, Himalaya Publishing House Pvt Ltd, 10<sup>th</sup> Edition, ISBN- 978-93-5051-588-4</li> <li>2. Dr. Niraj Kumar, "Organizational Behavior -A new Look Concept, Theory and Cases", Himalaya Publication, First Edition 2009.</li> <li>3. Margie Parikh , Rajen Gupta, "Organisational Behaviour", McGraw Hill Education (India) Private Limited,1st Edition.</li> <li>4. PG Aquinas, "Organizational Behaviour: concepts, realities, application and challenges", First edition, Excel Books.</li> </ol> |  |

| Semester                          | I  | Course Code                | 1T5 | Type of Course                               | Core   |  |  |  |
|-----------------------------------|--|----------------------------|-----|--|--|--|--|--|
| Course Name                       | <b>FINANCIAL REPORTING, STATEMENTS AND ANALYSIS</b>  |                            |     |  |  |  |  |  |
| Credits                           | 3  | Number of 1 hour lectures: | 30  |  |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                            |     |  |  |  |  |  |
| CO1                               | Given an accounting situation Students will be able to <b>evaluate</b> selected accounting standards and <b>perform</b> their application in actual practice   |                            |     |  |  |  |  |  |
| CO2                               | Given the Trial Balance and accompanying financial adjustments the future manager shall be able to <b>prepare</b> the financial statements and <b>calculate</b> the profit or loss of a firm as at the end of the financial year.  |                            |     |  |  |  |  |  |
| CO3                               | Given the financial statements a student will be able to <b>Prepare</b> Cash Flow statement to <b>evaluate</b> whether a firm is doing well financially and has sufficient cash to meet its obligations and support its growth or not.   |                            |     |  |  |  |  |  |
| CO4                               | Given the financial statements a student will be able to <b>perform</b> Ratio analysis and comment on the performance of the firm. Whether a firm is doing well or not. (As compared to its peers or year on year basis.)  |                            |     |  |  |  |  |  |
| CO5                               | Given the financial statements a student will be able to <b>formulate</b> common size statement, trend analysis as well as inter-firm and intra firm comparison (As compared to its peers or year on year basis.)  |                            |     |  |  |  |  |  |
| Detailed Contents:                |  |                            |     | Reference Book, Publisher, Edition, Page No. |  |  |  |  |
| Module 1                          | <b>Accounting Standards:</b> Introduction to Indian Accounting Standards. AS 2 (Valuation of Inventories), AS 3 (Cash Flow Statement), AS 6 (Depreciation Accounting), AS 10 (Accounting for Fixed Assets). Practical Questions on these accounting standards.   |                            |     |  | “Financial Accounting for Management” – N. Ramchandran, Ram Kumar Kakani – Tata Mac-Graw- Hill Publishing Co. Ltd. Second Edition. (491 – 564) |  |  |  |
| Module 2                          | <b>Financial Statement Reporting - I:</b> Preparation of Financial Statement – Profit & Loss, Balance sheet (as per Companies Act 2013)  |                            |     |  | <a href="https://resource.cdn.icai.org/53245bos420_67final-p1-ann.pdf">https://resource.cdn.icai.org/53245bos420_67final-p1-ann.pdf</a>        |  |  |  |
| Module 3                          | <b>Financial Statement Reporting - II:</b> Cash Flow Analysis – introduction, Meaning, features, objectives, importance, concept of cash and cash equivalents, cash flow from operating activities, investment activities & financing activities. Preparation of Cash Flow Statement (as per Companies Act 2013) |                            |     |  | “Financial Accounting & Analysis” – Narender Ahuja & Varun Dawar, Taxmann Publication (2015), 1 <sup>st</sup> Edition, (216 – 235)             |  |  |  |
| Module 4                          | <b>Analysis of financial Statement - I:</b> Introduction, Assessment of Business Performance through Ratio Analysis: Concept of Ratio, significance of ratio analysis, Interpretation of financial performance using ratio. Profitability Ratio, Liquidity Ratio, Solvency Ratio, Activity Ratio &               |                            |     |  | “Financial Accounting & Analysis” – Narender Ahuja & Varun Dawar, Taxmann Publication (2015), 1 <sup>st</sup> Edition,                         |  |  |  |

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|-----------------------------------|---|--|
|                                   | efficiency Ratio,   | (216 – 235)  |
| Module 5                          | <i>Analysis of financial Statement - II:</i> Techniques of Financial statement Analysis (Common size statement, Trend Analysis, Inter Firm Comparison, Intra Firm Comparison) Du-Pont Analysis  | "Financial Accounting & Analysis" - Narender Ahuja & Varun Dawar, Taxmann Publication (2015), 1 <sup>st</sup> Edition, (216 – 235) |
| Other Reference books and sources | <ol style="list-style-type: none"> <li>1. Dr.S.N. Maheshwari and Dr.S.K. Maheshwari, "Financial Accounting", Vikas, 10<sup>th</sup> Edition.</li> <li>2. Ambrish Gupta: "Financial Accounting Management an Analytical Perspective", Pearson Education-2009.</li> <li>3. Sehgal, "Accounts for Management",, Taxmann Publication Pvt. Ltd.</li> <li>4. Rustagi, "Management Accounting",, Taxmann Publication Pvt. Ltd</li> </ol> |  |

| Semester                          | I  | Course Code | 1T6                        | Type of Course | Core |  |  |
|-----------------------------------|--|-------------|----------------------------|----------------|------|--|--|
| Course Name                       | <b>BUSINESS STATISTICS &amp; ANALYTICS FOR DECISION MAKING</b>   |             |                            |                |      |  |  |
| Credits                           | 3  |             | Number of 1 hour lectures: |                | 30   |  |  |
| <b>Detailed Course Objectives</b> |  |             |                            |                |      |  |  |
| CO1                               | For a given dataset, the student should be able <b>estimate</b> the dispersion / variance & symmetry of the data using various measures and <b>draw</b> inferences to facilitate decision making.  |             |                            |                |      |  |  |
| CO2                               | For a given dataset, the student should be able <b>assess</b> the level of association between given variables in the data using various types of correlation analysis techniques. The students should also be able to <b>predict</b> the values of a variable using regression analysis techniques. |             |                            |                |      |  |  |
| CO3                               | For given situations a student should be able <b>determine</b> the various probabilities arising out of the situation and <b>make use of</b> probability theory and appropriate probability distributions for the purpose of decision making.  |             |                            |                |      |  |  |
| CO4                               | For a given research problem, student should be able to <b>construct</b> appropriate hypotheses and <b>draw</b> conclusions by using a suitable hypothesis testing procedure so as to <b>address</b> the research problem in question.   |             |                            |                |      |  |  |
| CO5                               | The student will be able to <b>differentiate</b> between various forms of analytics and will also be able to <b>choose</b> suitable analytics for decision making.   |             |                            |                |      |  |  |

| Detailed Contents:                |  | Reference Book, Publisher, Edition, Page No.  |
|-----------------------------------|--|---|
| Module 1                          | <b>Measures of Dispersion (Variation) &amp; Symmetry:</b> Significance of measuring Dispersion, Requisites and classification of measures of Dispersion, Distance measures - Range, Interquartile range. Average Deviation measures - Mean Absolute Deviation, Variance and Standard deviation, Chebyshev's Theorem, Coefficient of variation & its significance. Concept of Skewness & Kurtosis                     | Business Statistics, J. K. Sharma, Pearson, Second Edition, Pages 133-170, 171-179, 186-189 |
| Module 2                          | <b>Measures of Association:</b> Correlation, Types & Methods of Correlation analysis - Karl Pearson's coefficient of correlation, Spearman's Rank correlation, Probable error, Coefficient of Determination, Standard error of coefficient of correlation. Introduction to regression analysis and its advantages, Types of regression models, methods to determine regression coefficients (normal equations).      | Business Statistics, J. K. Sharma, Pearson, Second Edition, Pages 447-470, 481-488          |
| Module 3                          | <b>Probability:</b> Basic terminology, types of probability, probability rules, conditional probabilities, Baye's Theorem. Random Variables, Probability distributions; Binomial distribution, Poisson distribution, Normal distribution. Choosing correct probability distribution.   | Statistics For Management, Levin & Rubin, PHI, Seventh Edition, Pages 159-273               |
| Module 4                          | <b>Hypothesis Testing:</b> Introduction, Hypothesis testing procedure, errors in hypothesis testing. Power of a statistical test. t-test, ANOVA and Chi-Square test, (Students should be able to perform testing on spreadsheets)  | Business Statistics, J. K. Sharma, Pearson, Second Edition, Pages 327-360                   |
| Module 5                          | <b>Business Analytics</b> - Introduction to analytics, Differentiating descriptive, predictive, and prescriptive analytics, data mining vs data analytics, Industrial problem solving process, Decision needs and analytics, stakeholders and analytics, SWOT analysis, Business analytics in decision making, Categorization of Analytical Methods and Models. Introduction & applications of SPSS, R, Python, etc. | Essentials of Business Analytics, Jeffery Camm, Cengage, Pages 4-12, 21-34, 75-106          |
| Other Reference books and sources | 1. "Quantitative Methods for Business", Anderson (Thomson Learning Books)<br>2. "Statistical Methods", S.P. Gupta (S. Chand)<br>3. Levin Richard & Rubin David - "Statistics for Management" (Prentice Hall Of India).<br>4. SPSS Statistics for Data Analysis and Visualization 1st Edition, Keith McCormick, Jesus Salcedo, Jason Verlen, Jon Peck, Andrew Wheeler , Wiley Publishing, ISBN 978-1119003557         |   |

| Semester    | I                            | Course Code | 1T7 | Type of Course | Core |
|-------------|------------------------------|-------------|-----|----------------|------|
| Course Name | LEGAL & BUSINESS ENVIRONMENT |             |     |                |      |

| Credits                           | 3  | Number of 1 hour lectures:                          | 30  |
|-----------------------------------|--|---|---|
| <b>Detailed Course Objectives</b> |  |   |   |
| CO1                               | Given the circumstances, the learner will be able to <b>infer</b> legal aspects of doing business & <b>plan</b> business activities. In a given situation, the learner will be able <b>make use of</b> provisions of the Contract Act to <b>evaluate</b> a contract used in commercial practice.   |   |   |
| CO2                               | In a given situation, learner will be able to <b>distinguish</b> between various types of Companies and <b>explain</b> their comparative advantages and disadvantages. The learner will be able to <b>explain</b> the legal process involved in formation of a company and <b>understand</b> the relationships amongst the various stakeholders of the company.  |   |   |
| CO3                               | In context of Intellectual Property Rights (IPR) the learner will <b>understand</b> various components of IPR and <b>differentiate</b> between them. The learner can also <b>identify</b> the uses of IPR in business  |   |   |
| CO4                               | Under the given scenario, the learner will be able to describe various provisions of IT Act and will be able to use various provisions of Consumer Protection Act.   |   |   |
| CO5                               | A learner will be able to analyze the elements of Social, political, economic environment around a firm.   |   |   |
| <b>Detailed Contents:</b>         |  | <b>Reference Book, Publisher, Edition, Page No.</b> |   |
| Module 1                          | <b>Legal aspects of business and contracts:</b> Concept of law. Types of Law. Definition, Nature and types of contracts. Essentials of valid contract. Consideration and essentials of consideration. Free Consent. Legality and Validity of Contracts. Discharge of contracts. Arbitration: Meaning, Essential and Effects. Conciliation: Meaning, Procedure and Effect.  |   | Legal Aspects of Business Concepts and Application, Parul Gupta, Vikas Publishing House , ISBN - 978-9352718368, Chapter 1,2,4,6,15             |
| Module 2                          | <b>Companies Act 2013:</b> Characteristics and types of companies. Formation of companies; documents and registration process. Directors: Appointment, Powers, Duties and Liabilities. Company Meetings. Oppressions and Mismanagement   |   | Elements of Company Law, N.D. Kapoor, Sultan Chand & Sons, 30 <sup>th</sup> Edition, ISBN - 978-9351610465, Chapter 1,2,3,10,14,15,19           |
| Module 3                          | <b>IPR:</b> Types of IPR, overview and definitions. Patents and Patentability, working of patent and compulsory license, infringement. Meaning of copyright, ownership and assignment, licenses, Infringement. Meaning of Trademark, grounds of registration, infringement and passing off, assignment of trademark, collective trademark, certification marks. Definition of design, difference between copyright and design, Piracy of registered design. Trade secrets, meaning and essentials. Advantages and disadvantages of trade secrets |   | Business Legislation for Management, M C Kuchhal & V Kuchhal, Vikas Publishing House, 5 <sup>th</sup> Edition, ISBN- 978-9352718375, Chapter 10 |
| Module 4                          | <b>IT Act 2000:</b> Objectives & Scope, Important definitions, E-Governance and offences & Penalties. <b>Consumer Protection Act:</b> Definitions: Consumer, Defect and Deficiency. Unfair and Restrictive trade practices. Role and Functions of Consumer Protection Councils. Rights of Consumer. Consumer Forum; Structure and jurisdiction. Power of consumer forum. Remedies under act.   |   | Legal Aspects of Business Concepts and Application, Parul Gupta, Vikas Publishing House, ISBN - 978-9352718368, Chapter 28 & 30                 |

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| <b>Module 5</b>                          | <b>Socio-Political-Economic Environment:</b> Economic systems. Financial systems. Economic policies and macro-economic scenario. Constitutes of political environment. Constitutional provisions: Freedom of Trade and Reasonable restrictions. Economic roles of government. Demographic structure of India. Socio-Cultural environment of India | Economic Environment of Business, V.K. Puri; S.K. Misra, Himalaya Publishing House. 9 <sup>th</sup> Edition, ISBN - 978-9352028870, Chapter 2,7,8 |
| <b>Other Reference books and sources</b> | 1. Bhandari, Munish, "Professional Approach to Corporate Laws and Practice", Bharat Law House, New Delhi.<br>2. Shukla - "Mercantile Law" 30 <sup>th</sup> Ed. - S. Chand & Co.<br>3. N. D. Kapoor "Business Law" - S. Chand & Co.<br>4. Essentials Of Business Environment, K.Aswathappa, Himalaya Publishing House, 978-9350244746              |   |

| Semester                          | I  | Course Code                | 1T8 | Type of Course                                      | Core  |  |  |  |  |
|-----------------------------------|--|----------------------------|-----|---|---|--|--|--|--|
| Course Name                       | <b>MANAGERIAL SKILLS FOR EFFECTIVENESS</b>   |                            |     |   |   |  |  |  |  |
| Credits                           | 3  | Number of 1 hour lectures: |     | 30  |   |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                            |     |   |   |  |  |  |  |
| CO1                               | The student will be able to <b>make proper use</b> of group of words, synonyms and antonyms, phrases, idioms, proverbs for effective verbal communication        |                            |     |   |   |  |  |  |  |
| CO2                               | The student will be able to <b>write</b> essays and CV using Word Processor  |                            |     |   |   |  |  |  |  |
| CO3                               | The student will be able to <b>draft</b> business letters for given situations using Word Processor  |                            |     |   |   |  |  |  |  |
| CO4                               | The student will be able to <b>apply</b> basic functions of PowerPoint and will also be able to <b>create</b> effective PowerPoint Presentations using templates |                            |     |   |   |  |  |  |  |
| CO5                               | The student will be able to <b>use</b> various spreadsheet functions and will also be <b>create</b> useful spreadsheets  |                            |     |   |   |  |  |  |  |
| <b>Detailed Contents:</b>         |  |                            |     | <b>Reference Book, Publisher, Edition, Page No.</b> |   |  |  |  |  |
| Module 1                          | Basics of Verbal Communication - Pairs and Group of words, Synonyms and Antonyms, sentence construction and punctuation, phrases/ idioms , proverbs              |                            |     |   | Foundation programme English & Business Communication. The Institute of company |  |  |  |  |

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|  |  | secretaries of India. ( Study I)  |
| <b>Module 2</b>  | Essay Writing - Methods of expression, style and tone, synopsis and structure<br>Letter Writing - Business correspondence personnel (job obligations, CV and Resume)   | Foundation programme English & Business Communication. The Institute of company secretaries of India. ( Study II & V)   |
| <b>Module 3</b>  | Writing Business Letters and Quotations - Letter of Enquiry, Sales Promotion, Complaint, Placing Order, Quotations   | Foundation programme English & Business Communication. The Institute of company secretaries of India. ( Study VI to IX)<br><br>Computer Applications in Business, S. Sudalaimuthu and S. Anthony Raj, Himalaya Publication House, Chapter 10 (10.4) |
| <b>Module 4</b>  | PowerPoint - Auto Content Wizard, Design Templates, Views, Working with slides, Page Setup, Animations, Colour Schemes, Background, Master Slide.  | Computer Applications in Business, S. Sudalaimuthu and S. Anthony Raj, Himalaya Publication House, Chapter 10 (10.5)  |
| <b>Module 5</b>  | Spreadsheets - Spreadsheet basics, Standard Toolbar, Basic Functions, Sorting and Filtering, Charts, Statistical Functions, Data Management in Spreadsheet: Data Entry, Tables, Conditional Formatting, Data Sorting and Filtering, Data Validation. Formulas and Functions: Mathematical & Statistical Functions. Logical Functions in Spreadsheet: 'And', 'Or', 'If'. 'Lookup' functions and formula in spreadsheet. Data Visualization: Introduction to data visualization. Techniques of data visualization. Charts, Dynamic Tables, Pivot Tables, Dashboards. | Computer Applications in Business, S. Sudalaimuthu and S. Anthony Raj, Himalaya Publication House, Chapter 10 (10.6)  |
| <b>Other Reference books and sources</b>   | 1. Business Communication for Managers, Payal Mehra, Pearson Education India; Second edition, ISBN-13: 978-9332576643<br>2. Business Communication, Asha Kaul, Prentice Hall India Learning Private Limited; 2 edition, ISBN-13: 978-8120338487<br>3. Mastering MS Office: Computer Skill Development - Be Future Ready, Bittu Kumar, V&S Publishers, ISBN-13: 978-9350578780<br>4. Microsoft Excel Power Pivot & Power Query For Dummies, Michael Alexander, Wiley, ISBN-13: 978-8126562305.  |   |
| <b>List of Practical's/ Activities/ Assignments</b>  |  |   |
| This is a practical oriented course with internal assessment. The assessment shall be based on work book / practical record book containing 25 practicals/ |  |   |

activities/ assignment carrying FOUR marks each.

1. Give at least 10 examples of pairs and group of words and frame sentences indicating their usage.
2. What is meant by synonyms and antonyms. Explain with 5 examples each.
3. Give both synonyms and antonyms of the following words. (a) Absurd, (b) Diligent, (c) Fatal, (d) Joy, (e) Visible, (f) Yearn, (g) Zeal.
4. Use the following phrases/ idioms in sentences – (a) Cast a slur upon, (b) To come off with flying colours, (c) To get the better of, (d) To have one's hand full, (d) To have two strings to one bow, (e) To have an axe to grind, (f) To blow one's own trumpet, (g) To build castles in the air, (h) To kill two birds with one stone, (i) To pay one back in one's own coin.
5. Write any ten proverbs with their meaning

**Note: -Use MS Word for question number 6 to 15. Try to make use of all available features and functionalities in MS Word.**

6. Write essay on Black money and Indian Economy
7. Write an essay on Woman Entrepreneurs
8. Write an essay on Stock Exchanges and their role
9. Prepare your own CV using suitable template of MS Word
10. Write a covering letter to forward above CV for a fresher position in a MNC.
11. Write a letter of enquiry to LIC regarding late payment of premium.
12. A retailer has requested you to supply 6 fans at 20% disc for a valued customer. Draft a reply stating that the rate of discount cannot exceed 15%. Make an attempt to get the order.
13. A TV set which you ordered for your office conference room from Messrs. G K & Sons, Nagpur, was delivered in a damaged condition. Write to the supplier.
14. Place an order for 300 boxes of coloured crayons subject to the manufacturer's agreeing to pack them in specially designed boxes for Diwali presentation with no additional charges.
15. Invite Interior decoration firms to submit a quotation for carrying out renovation work of your computer centre. They are to submit designs for interior decoration and quote their terms separately for painting in Plastic Emulsion and for oil Distemper
16. Prepare a template using your institute logo in PowerPoint. Using the same template list out the members of SAARC/ EEC/ LAFTA/ EFTA
17. Using PowerPoint draft out the steps/ procedures for calculation of mean mode and median.

18. Design an effective advertisement copy for a product of your choice using PowerPoint performance of the salesmen's.
19. Design a PowerPoint presentation on Principles of Accounting (Concepts and Conventions), Golden Rules of Accounting.
20. Design a PowerPoint presentation explaining any 5 transactions of journal entries and ledger posting.
21. Develop the students Mark List for 20 students in a worksheet and calculate total, average, percentage, and save it. Specify the result also. (Field Names: Sr. No., Name of Student, Course, Gender, Category, Enrolment Number, Mark1, Mark2, Mark3, Total, Average, percentage and Result)
22. Using Statistical function in spreadsheet, present a correlation analysis (Rank Correlation and Pearson Coefficient) and regression analysis for the following information-

|                     |    |    |    |    |    |    |    |    |    |    |
|---------------------|----|----|----|----|----|----|----|----|----|----|
| Marks in Statistics | 48 | 62 | 36 | 65 | 98 | 39 | 25 | 75 | 82 | 92 |
| Marks in Economics  | 84 | 58 | 51 | 35 | 91 | 49 | 60 | 68 | 62 | 86 |

23. Using data available at <https://dbie.rbi.org.in/DBIE/dbie.rbi?site=home>/GDP draw a pie chart of Gross Value Added. Explain the contribution of various sectors with help of a bar chart.
24. Using Spreadsheet calculate Mean, Median, Mode, Standard Deviation, Max, Min, Square Root, Square of the historical data for one month available at [https://www.nseindia.com/products/content/equities/indices/historical\\_index\\_data.htm](https://www.nseindia.com/products/content/equities/indices/historical_index_data.htm)
25. Using Filters and Sort functions of spreadsheet rearrange the data (refer question no. 21) in following formats- Name of Students in Alphabetical Order , Descending order of % Marks, Ascending order of % Marks and also create a pivot table to represent the data

## SEMESTER - II

| Semester                          | II   | Course Code                | 2T1 | Type of Course | Core  |  |  |  |
|-----------------------------------|--|----------------------------|-----|----------------|---|--|--|--|
| Course Name                       | <b>FINANCIAL MANAGEMENT</b>  |                            |     |                |   |  |  |  |
| Credits                           | 3  | Number of 1 hour lectures: | 30  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |  |                            |     |                |   |  |  |  |
| <b>CO1</b>                        | Given financial cost parameters, the future manager will be able to <b>calculate</b> specific cost of capital (i.e. Cost of debt, preference, equity and retained earnings) and the weighted average cost of capital for any specific given firm.  |                            |     |                |   |  |  |  |
| <b>CO2</b>                        | Given different financing options, the future manager will be able to analyze the effect of operating and financial leverage on EPS and <b>recommend</b> a suitable long term financing mix for an organization by <b>applying</b> EBIT-EPS analysis, Indifference Level of EBIT and Financial Break-even Analysis for given financing options.  |                            |     |                |   |  |  |  |
| <b>CO3</b>                        | Given the cash-flows pertaining to a project, the future manager will be able to <b>estimate</b> projects' cash flows to <b>distinguish</b> between value creating and value destroying investments using time-value intensive DCF techniques (viz. NPV, IRR, discounted payback period, profitability index) and Non-DVF techniques (i.e. Payback Period and Average rate of return approach) |                            |     |                |   |  |  |  |
| <b>CO4</b>                        | Given the details pertaining to elements of working capital for a given level of activity, the future manager will be able to <b>ascertain</b> the components of current assets and current liabilities and <b>determine</b> the gross and net operating working capital requirement.  |                            |     |                |   |  |  |  |
| <b>CO5</b>                        | Given the expected dividends, future price of shares, investor expectations and funding requirements; the future manager will be able to <b>compute</b> the value of a share using various dividend discount models and <b>illustrate</b> whether dividend is relevant for firm valuation or not.  |                            |     |                |   |  |  |  |
| <b>Detailed Contents:</b>         |  |                            |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| <b>Module 1</b>                   | Cost of Capital: Concept and Importance; Measurement of Specific Costs – Redeemable and Irredeemable Debt, Redeemable and Irredeemable Preference shares, Equity and Retained Earnings; Computation of Overall Cost of Capital using book value and market value weights.  |                            |     |                |   |  |  |  |
|                                   | Financial Management, Theory Concepts and Problems, 5 <sup>th</sup> Revised Edition, R.P. Rustagi, Taxmann Publication, ISBN- 9878171949311 Chapter - 10   |                            |     |                |   |  |  |  |

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|-----------------|---|---|
|                 |   | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition, Chap No. 11   |
| <b>Module 2</b> | Leverage: Operating, Financial and Combined Leverage; EBIT-EPS Analysis; Indifference Level of EBIT and Financial Break-even Analysis.                        | Financial Management, Theory Concepts and Problems, 5 <sup>th</sup> Revised Edition, R.P. Rustagi, Taxmann Pulication, ISBN- 9878171949311 Chapter - 11&12<br><br>Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition, Chap No. 18 |
| <b>Module 3</b> | Capital Budgeting: Concept of Capital budgeting, Discounted and Non-discounted Cash Flow Techniques – NPV, IRR, PI, Discounted PBP, ARR & PBP.                | Financial Management, Theory Concepts and Problems, 5 <sup>th</sup> Revised Edition, R.P. Rustagi, Taxmann Pulication, ISBN- 9878171949311 Chapter - 7<br><br>Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition, Chap No. 9 & 10 |
| <b>Module 4</b> | Working Capital Management: Concept of Gross and Net Working Capital, Working Capital Approaches, Estimation and Calculations of Working Capital requirements | Financial Management, Theory Concepts and Problems, 5 <sup>th</sup> Revised Edition, R.P. Rustagi, Taxmann Pulication, ISBN- 9878171949311 Chapter - 17&18<br><br>Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition, Chap No. 13 |
| <b>Module 5</b> | Dividend Policy: Walter's Model; Gordon's Model and MM Hypothesis for Dividend Policy and Firm Valuation, Determinants and constraints of dividend decision   | Financial Management, Theory Concepts and Problems, 5 <sup>th</sup> Revised Edition, R.P. Rustagi, Taxmann Pulication, ISBN- 9878171949311 Chapter - 15&16  |

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|                                   |  | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition, Chap No. 30   |
| Other Reference books and sources |  | <p>1. Financial Management, I M Pandey, 10<sup>th</sup> Edition, Vikas Publishing House Pvt Ltd, ISBN: 9788125937142</p> <p>2. Financial Management, Comprehensive Text book with Case studies, M. Ravi Kishore, 7<sup>th</sup> Edition, Taxmann Publications, ISBN: 9788171945207</p> <p>3. Financial Management: Theory and Practice, Prasanna Chandra, 9<sup>th</sup> Edition, ISBN-13: 978-9339222574</p> <p>4. Financial Management: Problems &amp; Solutions, AN Sridhar and Padmavati Sridhar, 5<sup>th</sup> Edition, Packt Publishers, ISBN: 9789350238929</p> |

| Semester                          | II  | Course Code                | 2T2 | Type of Course                                      | Core   |  |  |  |  |
|-----------------------------------|---|----------------------------|-----|---|--|--|--|--|--|
| Course Name                       | <b>MARKETING MANAGEMENT</b>   |                            |     |   |  |  |  |  |  |
| Credits                           | 3   | Number of 1 hour lectures: |     | 30  |  |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                            |     |   |  |  |  |  |  |
| CO1                               | For a given marketing objective of a company the student manager will be able <b>to develop</b> a suitable marketing mix.   |                            |     |   |  |  |  |  |  |
| CO2                               | For a given product the student managers will be able <b>to apply</b> the three steps of target marketing: market segmentation, target marketing, and market positioning.   |                            |     |   |  |  |  |  |  |
| CO3                               | For various stages in the life cycle of the product the student managers will be able <b>to recommend</b> a suitable pricing strategy.  |                            |     |   |  |  |  |  |  |
| CO4                               | For a given company the student managers will be able <b>to evaluate</b> different distribution channel options and their suitability for the company's product.  |                            |     |   |  |  |  |  |  |
| CO5                               | For a given promotional objective of a company the student manager should be able <b>to develop</b> a suitable promotion mix (advertising, sales promotion, public relations, personal selling, and direct marketing etc.) for the product. |                            |     |   |  |  |  |  |  |
| <b>Detailed Contents:</b>         |   |                            |     | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |  |  |
| Module 1                          | <b>Introduction:</b> Concept, nature, scope and importance of marketing; Marketing concept and its evolution; Marketing mix; Marketing environment – macro and micro components and   |                            |     |   | Principles of Marketing, 13 <sup>th</sup> Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri |  |  |  |  |

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|  | their impact on marketing decisions; Market segmentation and positioning   | and Ehsan-Ul-Haq, Pearson, ISBN - 978-81-317-3101-7, Chapter 1,2,3  |
| <b>Module 2</b>                          | <b>Product Decisions:</b> Concept of a product; Classification of products; levels of product, Major product decisions; Product line strategies and product mix strategies; Product life cycle - strategic implications; New product development and consumer adoption process. Packaging and labelling.   | Principles of Marketing, 13 <sup>th</sup> Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri and Ehsan-Ul-Haq, Pearson, ISBN - 978-81-317-3101-7, Chapter 8,9   |
| <b>Module 3</b>                          | <b>Pricing Decisions:</b> Pricing objectives, Factors affecting price determination; Pricing policies methods and strategies, Initiating and responding to price change  | Principles of Marketing, 13 <sup>th</sup> Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri and Ehsan-Ul-Haq, Pearson, ISBN - 978-81-317-3101-7, Chapter 10,11 |
| <b>Module 4</b>                          | <b>Distribution Channels and Physical Distribution Decisions:</b> Nature, functions, and types of distribution channels; Distribution channel intermediaries; Channel management decisions; Retailing and wholesaling.   | Principles of Marketing, 13 <sup>th</sup> Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri and Ehsan-Ul-Haq, Pearson, ISBN - 978-81-317-3101-7, Chapter 12,13 |
| <b>Module 5</b>                          | <b>Promotion Decisions:</b> Communication Process; Promotion mix - advertising, personal selling, sales promotion, publicity and public relations; Determining advertising budget; Copy designing and testing; Media selection; Advertising effectiveness; Sales promotion -tools and techniques.  | Principles of Marketing, 13 <sup>th</sup> Edition, Philip Kotler, Gary Armstrong, Prafulla Agnihotri and Ehsan-Ul-Haq, Pearson, ISBN - 978-81-317-3101-7, Chapter 15,16 |
| <b>Other Reference books and sources</b> | 1. Marketing Management, Rajan Saxena, 5 <sup>th</sup> Edition, McGraw Hill Education, ISBN-13: 978-9339223304<br>2. Introduction to Marketing, Adrian Palmer, 3 <sup>rd</sup> Edition, Oxford Publishing, ISBN: 9780199602131<br>3. Marketing Management, Philip Kotler and Keven Lane Keller, 15 <sup>th</sup> Edition, Pearson Education, ISBN-13: 978-9332587403<br>4. Marketing Management - Indian Context with Global Perspective, V S Ramaswamy & S Namakumari, 5 <sup>th</sup> Edition, Mc Graw Hill India, ISBN-13: 978-1259026416 |   |

| Semester    | II                               | Course Code | 2T3 | Type of Course | Core |
|-------------|----------------------------------|-------------|-----|----------------|------|
| Course Name | <b>HUMAN RESOURCE MANAGEMENT</b> |             |     |                |      |

|                                   |   |   |    |
|-----------------------------------|---|---|----|
| Credits                           | 3   | Number of 1 hour lectures:  | 30 |
| <b>Detailed Course Objectives</b> |   |   |    |
| CO1                               | Students should be able to <b>explain</b> the importance of Human Resource Management for an organisation and also distinguish between Personnel and HR Management.   |   |    |
| CO2                               | For a given job profile, students should be able to <b>develop</b> a job analysis and produce a job description and job specification.  |   |    |
| CO3                               | Students should be able to <b>design</b> a Human Resource Plan for an organisation and <b>construct</b> its Selection Process   |   |    |
| CO4                               | Students should be able to <b>justify</b> the applicability of various techniques of Training   |   |    |
| CO5                               | Students should be able to <b>outline</b> the performance appraisal process and <b>identify</b> and <b>explain</b> the utility of various modern and traditional methods of Performance Appraisal.  |   |    |
| <b>Detailed Contents:</b>         |   | <b>Reference Book, Publisher, Edition, Page No.</b>   |    |
| Module 1                          | Introduction, Nature, scope, objectives, importance and functions of HRM , Human resource as an asset in organization; Difference between Personnel Management and Human Resource Management, Roles and Qualities of HR Manager ; human resource management in dynamic environment ; Introduction to Strategic HRM. Organizational and HR Strategies. | Human Resource Management – Text and Cases-Dr.S S Khanka, S.Chand Publication, Ch.1,3<br>Human Resource and Personnel Management – Text and cases, K. Aswathappa, Publication - McGraw- Hill Publishing co. ltd. Ch-1,3<br>Essentials of Human Resource Management & Industrial Relations – P.Subba Rao, 3 <sup>rd</sup> revised edition – Himalaya Publication- Ch-1,2 |    |
| Module 2                          | Job Analysis – Meaning, Uses, Process and methods of collecting data for job analysis, Job Description, Job Specifications & Role Analysis, Concept of Job Design, Factors affecting Job Design, Techniques of Job Design, Cases and Exercises in understanding Job Analysis.   | Human Resource and Personnel Management – Text and cases, K. Aswathappa, Publication - McGraw- Hill Publishing co. ltd. Ch-5<br>Essentials of Human Resource Management & Industrial Relations – P.Subba Rao, 3 <sup>rd</sup> revised edition – Himalaya Publication- Ch-3<br>Human Resource Management – Text and Cases-Dr.S S Khanka, S.Chand Publication, Ch.5       |    |
| Module 3                          | Human Resources Planning; Need, importance & Objectives of Human Resources Planning; Factors affecting HRP; Recruitment and Selection—Meaning, Sources and Process; Induction and Placement   | Human Resource Management – Text and Cases-Dr.S S Khanka, S.Chand Publication, Ch.4,6,7,8   |    |

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|  |   | <p>Essentials of Human Resource Management &amp; Industrial Relations – P.Subba Rao, 3<sup>rd</sup> revised edition – Himalaya Publication- Ch-4,5,6</p> <p>Human Resource and Personnel Management – Text and cases, K. Aswathappa, Publication - McGraw- Hill Publishing co. ltd. Ch-4,6,7,8</p>  |
| <b>Module 4</b>                          | <p>Introduction of Training; Objectives and Importance of Training; Training Process, Training Needs Identification. Types and Techniques of Training and Development; Evaluation of Training, Management/Executive Development Programs-Need and Importance &amp; Objectives</p>   | <p>Essentials of Human Resource Management &amp; Industrial Relations – P.Subba Rao, 3<sup>rd</sup> revised edition – Himalaya Publication- Ch-9,10</p> <p>Human Resource Management – Text and Cases- Dr.S S Khanka, S.Chand Publication, Ch.10,11</p> <p>Human Resource and Personnel Management – Text and cases, K. Aswathappa, Publication - McGraw- Hill Publishing co. ltd. Ch-9</p> |
| <b>Module 5</b>                          | <p>Performance Appraisal- concept, objectives, Importance, Methods; Potential Appraisals Compensation Management- Concept and components; Job Evaluation; Components of salary, incentives, bonus, ESOPs, Fringe Benefits</p> <p>Ancillary Topics- Career Planning &amp; Development, Employee Separations, Downsizing &amp; Outplacement, HRIS, Industrial Relations.</p>  | <p>Essentials of Human Resource Management &amp; Industrial Relations – P.Subba Rao, 3<sup>rd</sup> revised edition – Himalaya Publication- Ch-8,11,14, 15,16,19</p> <p>Human Resource and Personnel Management – Text and cases, K. Aswathappa, Publication - McGraw- Hill Publishing co. ltd. Ch-10,11,12,13,21,22</p>  |
| <b>Other Reference books and sources</b> | <ol style="list-style-type: none"> <li>1. P. Jyothi and D.N Venkatesh (2013), "Human Resource Management". Oxford Publication. 2nd Edition</li> <li>2. V.S.P.Rao and C.B. Mamoria (2012), "Personal Management (Text and Cases)", Himalaya Publications, Thirtieth Edition</li> <li>3. Dr. Sunaina Sardana, "Human Resource Management", Taxmann Publication Pvt. Ltd.</li> <li>4. Human Resource Management, 11ed, David A. Decenzo, Stephen P. Robbins, Susan L. Verhulst, Wiley, ISBN: 978-8126553785</li> </ol> |   |
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| Semester                          | II  | Course Code                | 2T4 | Type of Course | Core  |  |  |  |
|-----------------------------------|---|----------------------------|-----|----------------|---|--|--|--|
| Course Name                       | <b>OPERATIONS MANAGEMENT</b>  |                            |     |                |   |  |  |  |
| Credits                           | 3   | Number of 1 hour lectures: | 30  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |   |                            |     |                |   |  |  |  |
| <b>CO1</b>                        | At the end of the course the students can <b>apply</b> the concept of operations management in manufacturing and service sector and will be able to <b>plan</b> and <b>implement</b> production and service related decisions.                    |                            |     |                |   |  |  |  |
| <b>CO2</b>                        | At the end of the course the student will be able to <b>plan</b> production schedules and plan resources (material and machine) required for production   |                            |     |                |   |  |  |  |
| <b>CO3</b>                        | At the end of the course the students can <b>design</b> maintenance schedules in manufacturing units, <b>identify</b> and <b>propose</b> material handling equipments and implement industrial safety rules                                       |                            |     |                |   |  |  |  |
| <b>CO4</b>                        | At the end of the course the students will be able to <b>apply</b> the concepts of purchase, stores and inventory management and <b>analyze</b> and <b>evaluate</b> material requirement decisions  |                            |     |                |   |  |  |  |
| <b>CO5</b>                        | At the end of the course the students can <b>measure</b> performance related to productivity and will be able to <b>conduct</b> basic industrial engineering study on men and machines.   |                            |     |                |   |  |  |  |
| <b>Detailed Contents:</b>         |   |                            |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| <b>Module 1</b>                   | <b>Introduction:</b> Concept of Operations Management, Difference between Manufacturing & Services, Capacity and equipment selection decisions. Types of Production, Plant Location Factors, Types of Manufacturing & Service Layouts             |                            |     |                |   |  |  |  |
| <b>Module 2</b>                   | <b>PPC</b> - Concept of Production Planning and Control, Planning Premise, Make to Stock, Make to Order and Assemble to Order, Process Planning, MPS (Master Production Schedule), MRP (Material Requirement Planning), MRP II, Material Handling |                            |     |                |   |  |  |  |

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| <b>Module 3</b>                          | <b>Maintenances Management</b> - Types of Maintenance, Maintenance Costs, OEE (Overall Equipment Efficiency), Material handling - principles, types of MHE (Material Handling Equipment), Industrial Safety, Ergonomics  | Production and Operations Management, By S. Anil Kumar, N.Suresh, New Age International Publishers, Chapter 8-Page 205<br><br>Production and Materials Management, By K. Shridhara Bhat, Himalaya Publishing house, Chapter 14,15 and Chapter 25    |
| <b>Module 4</b>                          | <b>Materials Management</b> - Purchase management, Stores management, Vendor Selection, (Practical Problems of Vendor Selection), Inventory Management, Inventory Costs, Inventory management tools, Concept of EOQ (Practical Problems of EOQ).   | Production and Operations Management By K. Aswathappa and K Shridhar Bhatt, Himalaya Publishing House, Chapter 21,22 and 23   |
| <b>Module 5</b>                          | <b>Industrial Engineering</b> -Concepts of productivity, tools of increasing productivity,Labor and machine productivity. Introduction to work-study, work measurement, method study, motion study and time study  | Industrial Engineering and Production Management, By Martand Telsang, S.Chand Publications, Chapter 2,3,4 and 5<br><br>Production and Operations Management, By S.Anil Kumar, N.Suresh, Second Edition, New Age International Publishers, Chapter 7 |
| <b>Other Reference books and sources</b> | 1. Procurement and Principles Management, Peter Baily, Barry Crocker, David Farmer, David Jessop, 11 <sup>th</sup> Edition, Pearson Education, ISBN: 978-9352868322<br>2. Purchasing and Materials Management, P. Gopalakrishnan, 1 <sup>st</sup> Edition, McGraw Hill Education, ISBN-13: 978-0074516508<br>3. Materials Management: An Integrated Approach, P. Gopalakrishnan, M. Sundaresan, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120300279<br>4. Industrial Engineering and Production Management, Martand Telsang, 2nd Rev Edn 2006 edition, S Chand Publications, ISBN-13: 978-8121917735 |   |

| Semester    | II                            | Course Code | 2T5 | Type of Course | Core |
|-------------|-------------------------------|-------------|-----|----------------|------|
| Course Name | <b>INTERNATIONAL BUSINESS</b> |             |     |                |      |

|                                   |  |                            |   |
|-----------------------------------|--|----------------------------|---|
| Credits                           | 3  | Number of 1 hour lectures: | 30  |
| <b>Detailed Course Objectives</b> |  |                            |   |
| CO1                               | Students should be able to <b>understand</b> various concepts and terminologies involved in International Business and importance of international trade   |                            |   |
| CO2                               | Students should be able to <b>evaluate</b> various modes of entry in to International business and should be able to <b>select</b> the best mode of entry given a situation.   |                            |   |
| CO3                               | Students should be able to <b>relate and discuss</b> the presence of macro factors (PESTEL ) on international business environment   |                            |   |
| CO4                               | Students should be able to <b>examine</b> and <b>elaborate</b> the role of various Government institutions in India which support International trade.   |                            |   |
| CO5                               | Students should be able to <b>perceive</b> the concepts in recent EXIM policy of India and <b>relate it</b> to the flow of FDI as well as direction of Indian foreign trade.   |                            |   |
| <b>Detailed Contents:</b>         |  |                            | <b>Reference Book, Publisher, Edition, Page No.</b> |
| Module 1                          | Introduction to International business, its importance and various concepts involved in it such as: entrepot trade, various tariff and non tariff barriers, regional trading blocs and types of trade agreements.                                  |                            |   |
| Module 2                          | Modes of entry into International Business, Internationalization process and managerial implications case studies related to internationalization process. International business approaches: ethnocentric, polycentric, regiocentric, geocentric. |                            |   |
| Module 3                          | Various Macro factors affecting International Business Environment: Political, Economical, Socio-cultural, Technological, Environmental and Legal factors.   |                            |   |
| Module 4                          | Various Government Institutes supporting foreign trade and their role: DGFT, Export Promotion Council, ECGC, SEZs, EPZs and EOUs, EXIM Bank and FEMA   |                            |   |
| Module 5                          | Drivers of FDI, Flow of FDI in India , EXIM Policy of India Direction of India's Foreign Trade (imports and exports scenario), Role of RBI in exchange rate management   |                            |   |
| Other                             | 1. International Business - Environment and Operations, John D. Daniel, Lee Radbaugh, Daniel p Sullivan, Prashant Sawlan, 16 <sup>th</sup> Edition,  |                            |   |

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| <b>Reference books and sources</b> | Pearson Education, ISBN-13: 978-9352861880<br>2. International Relations, Pavneet Singh, 1 <sup>st</sup> Edition, McGraw Hill Education, ISBN-13: 978-9352602827<br>3. International Business (SIE), 6th Edition, Charles W L Hill, Arun K Jain, McGraw Hill Education, ISBN-13: 978-0070221796<br>4. International Business, 6th Edition, K. Aswathappa, McGraw Hill Education, ISBN-13: 978-9339222581 |
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| Semester                          | II  | Course Code                | 2T6 | Type of Course | Core  |  |  |  |
|-----------------------------------|---|----------------------------|-----|----------------|---|--|--|--|
| Course Name                       | <b>CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABILITY</b>   |                            |     |                |   |  |  |  |
| Credits                           | 3   | Number of 1 hour lectures: | 30  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |   |                            |     |                |   |  |  |  |
| <b>CO1</b>                        | Given the concept of CSR, the future manager will be able to <b>identify</b> the various activities which can benefit the organization under the banner of CSR.   |                            |     |                |   |  |  |  |
| <b>CO2</b>                        | Given a chance, the future manager will be able to <b>frame</b> and <b>recommend</b> the CSR policy according to sustainable development.   |                            |     |                |   |  |  |  |
| <b>CO3</b>                        | Given the framework, the future manager will be able to <b>plan</b> the CSR activity according to the various laws and regulations.   |                            |     |                |   |  |  |  |
| <b>CO4</b>                        | Given the details pertaining to government and non government organizations, the future manager will be able to <b>ascertain</b> the role of various stakeholders in CSR activities and <b>incorporate</b> the guidelines issued by regulatory guidelines in CSR policy.  |                            |     |                |   |  |  |  |
| <b>CO5</b>                        | Given the task of CSR , the future manager will be able to <b>plan and implement</b> various activities to be taken under CSR activity and evaluate its effectiveness.  |                            |     |                |   |  |  |  |
| <b>Detailed Contents:</b>         |   |                            |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| <b>Module 1</b>                   | <b>Introduction to CSR-</b> Meaning & Definition of CSR, History & evolution of CSR, Motives of CSR, Benefits and Internal scope of CSR, Enterprise Social Responsibility, Concept of sustainability & Stakeholder Management. CSR through triple bottom line and Sustainable Business; environmental aspect of CSR; Chronological evolution of CSR in India. |                            |     |                |   |  |  |  |
|                                   | <b>Corporate Social Responsibility in India. Trends, Issues and Strategies</b> By Sateesh Gouda M, A.G. Khan, S.L. Hiremath, Anchor Academic  |                            |     |                |   |  |  |  |

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|  |   | Publishing, 2017, Pg-9-42<br><br><b>Corporate Social Responsibility: A Very Short Introduction</b> By Jeremy Moon, Oxford University Press ,  |
| <b>Module 2</b>                          | <b>Framework of Social Orientations-</b> Management and Social Theories , Five types of managers, organization classification. <b>International framework</b> for corporate social Responsibility, Millennium Development goals, Sustainable development goals, Relationship between CSR and MDGs. United Nations (UN) Global Compact 2011. UN guiding principles on business and human rights. OECD CSR policy tool, ILO tri-partite declaration of principles on multinational enterprises and social policy. | <b>Business Ethics, Text and cases</b> by CSV Murthy , Himalaya Publishing House, ISBN 81-8318-418-1, 2008, Pg 369-372  |
| <b>Module 3</b>                          | <b>CSR-Legislation In India &amp; the world-</b> Section 135 of Companies Act 2013.Scope for CSR Activities under Schedule VII, Appointment of Independent Directors on the Board. The Drivers of CSR in India, Changing expectations of social responsibility, four faces of social responsibility, the regulatory environment in India Counter trends. Performance in major business and programs.  | <b>Business Ethics, Text and cases</b> by CSV Murthy , Himalaya Publishing House, ISBN 81-8318-418-1, 2008, Pg 365-387  |
| <b>Module 4</b>                          | <b>Identifying key stakeholders of CSR &amp; their roles-</b> Role of Public Sector in Corporate, government programs that encourage voluntary responsible action of corporations. Role of Nonprofit &Local Self-Governance in implementing CSR; Contemporary issues in CSR & MDGs. Global Compact Self-Assessment Tool, National Voluntary Guidelines by Govt. of India. Understanding roles and responsibilities of corporate foundations   | <b>Business and Community: The Story of Corporate Social Responsibility in India</b> ,By Pushpa Sundar, Sage Publications<br><br><b>Corporate Social Responsibility in India</b> By Bidyut Chakrabarty, Routledge publications, Pg, 99-121<br><br><a href="https://globalcompactselfassessment.org/about_thistool">https://globalcompactselfassessment.org/about_thistool</a> |
| <b>Module 5</b>                          | <b>Current trends and opportunities in CSR-CSR</b> as a Strategic Business tool for Sustainable development. Review of successful corporate initiatives & challenges of CSR. Case Studies of Major CSR Initiatives.   | <b>India CSR Report 2019: Trends and Prospects of CSR</b> By Girija Srinivasan, Narasimhan Srinivasan, SAGE Publications,<br><br><b>Philanthropy in India: Promise to Practice</b> By Meenaz Kassam, Femida Handy, Emily Jansons  |
| <b>Other Reference books and sources</b> | 1. CV Baxi and Ajit Prasad, "Corporate Social Responsibility Concept and Cases, The Indian Experience", Excel Books, 2006, ISBN 81-7446-449-2<br><br>2. Nayan Mitra, René Schmidpeter, "Corporate Social Responsibility in India: Cases and Developments After the legal mandate", Springer publications  |   |

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|  | <p>3. <a href="http://egyankosh.ac.in/handle/123456789/8107">http://egyankosh.ac.in/handle/123456789/8107</a></p> <p>4. <a href="http://egyankosh.ac.in/handle/123456789/16465">http://egyankosh.ac.in/handle/123456789/16465</a></p> <p>5. <a href="http://www.forbesindia.com/blog/beyond-the-numbers/corporate-india-and-csr/">http://www.forbesindia.com/blog/beyond-the-numbers/corporate-india-and-csr/</a></p> <p>6. <a href="https://blog.ipleaders.in/csr-laws-india/">https://blog.ipleaders.in/csr-laws-india/</a></p> <p>7. <a href="https://www.ilo.org/empent/areas/mne-declaration/lang--en/index.htm">https://www.ilo.org/empent/areas/mne-declaration/lang--en/index.htm</a></p> <p>8. <a href="http://www.teachcsr.com">http://www.teachcsr.com</a></p> <p>9. <a href="https://economictimes.indiatimes.com/blogs/ResponsibleFuture/sustainability-and-csr-trends-for-india-in-2017/">https://economictimes.indiatimes.com/blogs/ResponsibleFuture/sustainability-and-csr-trends-for-india-in-2017/</a></p> |
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| Semester                          | II  | Course Code                | 2T7 | Type of Course                                      | Core |  |  |  |
|-----------------------------------|---|----------------------------|-----|---|------|--|--|--|
| Course Name                       | <b>COST ACCOUNTING</b>  |                            |     |   |      |  |  |  |
| Credits                           | 3   | Number of 1 hour lectures: | 30  |   |      |  |  |  |
| <b>Detailed Course Objectives</b> |   |                            |     |   |      |  |  |  |
| <b>CO1</b>                        | Given an information about basic conceptual framework of cost, the student will be able of <b>identify/ classify</b> different elements/ classification of cost and will be able to <b>prepare</b> cost sheet and prepare quotations for various business proposals   |                            |     |   |      |  |  |  |
| <b>CO2</b>                        | Given an information about cost, volume and profit for specific product for mention time period, a student will able to <b>compute</b> Break-even point, Margin of safety, Profit volume ratio, desired profit / desired sales as well as able to <b>evaluate</b> the decision making proposals(suitable product mix / dropping a product line / fixation of selling price / make or buy decisions/Key Factor Analysis) |                            |     |   |      |  |  |  |
| <b>CO3</b>                        | Given information about relevant expenses, a student will be able to <b>classify</b> the cost by nature and <b>estimate</b> cost of operating a service   |                            |     |   |      |  |  |  |
| <b>CO4</b>                        | Given an information about Expenses & Income / Receipt & Payment / Projected Sales, a student will be able to <b>prepare</b> relevant functional level budgets for an organisation  |                            |     |   |      |  |  |  |
| <b>CO5</b>                        | Given an information about standard and actual performance, the student will be able to <b>determine</b> Direct Material and Direct Labour Variances.   |                            |     |   |      |  |  |  |
| <b>Detailed Contents:</b>         |   |                            |     | <b>Reference Book, Publisher, Edition, Page No.</b> |      |  |  |  |

|  |   |   |
|--|---|---|
| <b>Module 1</b>                          | <b>Conceptual framework of Cost Accounting:</b> Basic Concepts of Cost Accounting, Objectives, Importance and Advantages of Cost Accounting, Cost Centre, Cost Unit, Elements of Cost, Classification and Analysis of Costs, Relevant and Irrelevant Costs, Differential Costs, Sunk Cost, Opportunity Cost. Unit & Output Costing - Preparation of Cost Sheet and Tender/Quotations.   | "Cost Accounting - Principles & Practices"- M N Arora (2013) Twelfth edition, Vikas Publishing House Pvt. Ltd. (1.1 – 1.15), (6.1 – 6.41) |
| <b>Module 2</b>                          | <b>Marginal Costing And Profit Volume Relationship And Decision Making :-</b> Introduction, Application of Marginal costing in terms of cost control, profit planning, dropping a product line, fixation of selling price, make or buy decisions, key or limiting factor, selection of suitable product mix, desired level of profits, level of activity planning- Break-even-analysis: Application of BEP for various Business problems  | "Cost & Management Accounting" - Ravi Kishore (2016), Taxmann Publication, 6 <sup>th</sup> Edition, (484 – 493),(540-548)                 |
| <b>Module 3</b>                          | <b>Operating Costing:-</b> Concept of operating Costing Features of operating costing: Transport costing (Standing charge, Repair and Maintenance Charge and Running charges and log sheet), Canteen, Hospital and hotels costing.  | "Cost & Management Accounting" - Ravi Kishore (2016), Taxmann Publication, 6 <sup>th</sup> Edition, (408 – 422)                           |
| <b>Module 4</b>                          | <b>Budgeting and Budgetary Control</b> - Concept of Budgeting and Budgetary Control, Essential features, Merits and Limitations of Budgetary Control. Types of Budgets, Static and Flexible Budgeting, Preparation of Cash Budget, Sales Budget, Production Budget and Master Budget,   | "Cost & Management Accounting" - Ravi Kishore (2016), Taxmann Publication, 6 <sup>th</sup> Edition, (578 - 599)                           |
| <b>Module 5</b>                          | <b>Standard Costing &amp; Variance Analysis:</b> Introduction, Meaning and limitations of Standard Costing, Standard costing as a management Tool, Historical costing, Estimated Costing and Standard Costing, Standard Cost and Budgeted Cost, Determination of Standard Cost for Direct Material, Direct Labour Cost. Variance Analysis: Direct Material Variance – Material Cost Variance, Material Rate Variance, Material Quantity Variance, Material Mix Variance, and Material Yield Variance, Direct labour Variance – Labour Cost Variacne, Labour Rate Variance, Labour efficiency Variance, Labour Mix Variance, Idle Time Variance and Labour Yield Variance. | "Cost & Management Accounting" - Ravi Kishore (2016), Taxmann Publication, 6 <sup>th</sup> Edition, pg 631-653                            |
| <b>Other Reference books and sources</b> | 1. Cost Accounting: Texts and Problems, M C Shukla, T S Grewal, Dr. M P Gupta, Revised Edition, S Chand & Company, ISBN-13: 978-8121919630<br>2. Cost Accounting, RSN Pillai, V. Bagawathi, , Revised Edition, S Chand & Company, ISBN-13: 978-8121904933<br>3. Cost Accounting, M Y Khan P K Jain, Second Edition, McGraw Hill Education, ISBN-13: 978-9339203443<br>4. Cost Accounting Text Book – V.K. Saxena C.D. Vashishtha, Sultan Chand Publication, ISBN-13: 9788180546112  |   |

|                                   |  |                  |     |                |   |  |  |  |  |
|-----------------------------------|--|------------------|-----|----------------|---|--|--|--|--|
| Semester                          | III  | Course Code      | 2T8 | Type of Course | Elective  |  |  |  |  |
| Course Name                       | <b>MANAGEMENT CASE ANALYSIS</b>  |                  |     |                |   |  |  |  |  |
| Credits                           | 4  | Number of hours: |     | 40             |   |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |                |   |  |  |  |  |
| CO1                               | Given a situation a student will be able to <b>construct</b> SWOT for a concerned orgnaisation or situation as well as he/ she will be able to indentify key actors/stakeholders in the given situation                                |                  |     |                |   |  |  |  |  |
| CO2                               | A student will be able to <b>evaluate</b> the dilemma (Problem/ Issues/ Concerns) in the case.   |                  |     |                |   |  |  |  |  |
| CO3                               | A student will be able to <b>develop</b> suitable alternatives for the dilemma identified.   |                  |     |                |   |  |  |  |  |
| CO4                               | A student will be able to <b>analyse</b> and <b>evaluate</b> the alternatives using the theoretical framework.   |                  |     |                |   |  |  |  |  |
| CO5                               | A Student will be able to discuss <b>suggest</b> suitable roadmaps to overcome the identified dilemma.   |                  |     |                |   |  |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |     |                | <b>Reference Book, Publisher, Edition, Page No.</b>   |  |  |  |  |
| Module 1                          | Introduction – Persuasion, Augmentation and Case Method, What is a case?, How to Analyse a Case, Case Demonstration, Problems, Decisions and Evaluation  |                  |     |                | The Case Study Handbook, William Ellett, HBR Press, Revised Edition, ISBN-13: 978-1633696150, Part 1<br><br>Management Case Studies, A Student's Handbook, Kulkarni, Patil Navalagi & Yaraddi, Notion PressISBN 978-1-64324-309-2, (Page 3) |  |  |  |  |
| Module 2                          | Cases on General Management and Strategic Management (A student or group of student is expected to present/ anlayse/ provide solution to minimum two cases or 4-5 caselets in the subject domain of General and Strategic Management.) |                  |     |                | Management Case Studies, A Student's Handbook, Kulkarni, Patil Navalagi & Yaraddi, Notion PressISBN 978-1-64324-309-2, (Page 19-36)   |  |  |  |  |
| Module 3                          | Cases on Marketing Management (A student or group of student is expected to present/   |                  |     |                | Management Case Studies, A Student's  |  |  |  |  |

|  |  |   |
|--|--|---|
|  | anlayse/ provide solution to minimum two cases or 4-5 caselets in the subject domain of Marketing Management.)   | Handbook, Kulkarni, Patil Navalagi & Yaraddi, Notion Press ISBN 978-1-64324-309-2, (Page 37-62)                                       |
| <b>Module 4</b>                          | Cases on Financial Management (A student or group of student is expected to present/ anlayse/ provide solution to minimum two cases or 4-5 caselets in the subject domain of General and Financial Management.)  | Management Case Studies, A Student's Handbook, Kulkarni, Patil Navalagi & Yaraddi, Notion Press ISBN 978-1-64324-309-2, (Page 63-80)  |
| <b>Module 5</b>                          | Cases on Human Resource Management (A student or group of student is expected to present/ anlayse/ provide solution to minimum two cases or 4-5 caselets in the subject domain of General and Human Resource Management.)  | Management Case Studies, A Student's Handbook, Kulkarni, Patil Navalagi & Yaraddi, Notion Press ISBN 978-1-64324-309-2, (Page 81-102) |
| <b>Other Reference books and sources</b> | 1. Management Cases, Revised Edition, Peter Drucker, HarperBusiness; Revised edition, ISBN-13: 978-0061435157<br>2. Case Studies in Management, Akhilesh Chandra Pandey, Case Studies in Management, ISBN-13: 978-9384588045<br>3. Case Studies in Strategic Management, Sanjay Mohapatra, Pearson Education; First edition, ISBN-13: 978-8131759844<br>4. Case Studies in Marketing, Kanwal Nayan Kapil, Pearson Education; First edition, ISBN-13: 978-8131756331<br>5. Case Studies in Human Resource Management, Sanjeev Bansal, Jaya Yadav, Hargovind Kakkar, I K International Publishing House Pvt. Ltd, ISBN-13: 978-9384588854<br>6. Case Studies in Finance, Rober Brunner, Kenneth Eades, Michael Schill, McGraw Hill Education; 6 edition, ISBN-13: 978-9339204822 |   |

#### Suggested Rubrics for Case Analysis Evaluation based on one evaluation case let analysis by an individual student at the end of the course:

| Case Study Grading Rubric : An individual student shall be given a caselet and based on his/her analysis and presentation grading is to done |  |            |                |                      |                  |
|--|--|------------|----------------|----------------------|------------------|
| Percentage Scale:  |  | 0-40 Marks | 40-60Marks     | 60-80Marks           | 80 – 100Marks    |
|  |  | %          | Below Standard | Approaching Standard | At Standard      |
|  |  |            |                |                      | Exceeds Standard |

|   |     |  |  |  |   |
|---|-----|--|--|--|---|
| <b><i>Clear explanation of key strategic issues</i></b> <ul style="list-style-type: none"> <li>The problems, scope, and seriousness was clearly identified in the discussions.</li> <li>There was a well focused diagnosis of strategic issues and key problems that demonstrated a good grasp of the company's present situation and strategic issues.</li> <li>Effective Executive Summary</li> <li>Did not waste space summarizing information already found in the case.</li> </ul> | 20% | Shows little understanding of the issues, key problems, and the company's present situation and strategic issues.<br><br>Executive summary missing or poorly constructed | Shows some understanding of the issues, key problems, and the company's present situation and strategic issues.<br><br>Executive summary inadequate                  | Shows adequate knowledge of the issues, key problems, and the company's present situation and strategic issues.<br><br>Executive summary adequate  | Shows superior knowledge of the issues, key problems, and the company's present situation and strategic issues.<br><br>Effective Executive Summary                              |
| <b><i>Valid arguments; analysis of financial and other functional performance with relevant supportive detail</i></b> <ul style="list-style-type: none"> <li>Logically organized, key points, key arguments, and important criteria for evaluating business strategies were easily identified</li> <li>Critical issues and key problems that supported the Case Analysis were identified and clearly analyzed and supported.</li> </ul>   | 20% | Critical issues and key problems that supported the Case Analysis were poorly identified, analyzed, and supported.   | Critical issues and key problems that supported the Case Analysis were not clearly identified, analyzed, and supported.  | Critical issues and key problems that supported the Case Analysis were partially identified, analyzed, and supported.  | Critical issues and key problems that supported the Case Analysis were clearly identified, analyzed, and supported.   |
| <b><i>Appropriate analysis, evaluation, synthesis for the specific industry identified</i></b> <ul style="list-style-type: none"> <li>There was complete data on which to base a thorough analysis</li> <li>Key change drivers underlying the issues were identified.</li> <li>Synthesis, analysis, and evaluations were clearly presented and supported in a literate and effective manner.</li> </ul>   | 20% | Analysis of key change drivers and the underlying the issues inadequate.   | Analysis of key change drivers and the underlying the issues were not identified.  | Analysis of key change drivers and the underlying the issues were partially identified   | Analysis of key change drivers and the underlying the issues were clearly identified  |
| <b><i>Conclusions and recommendations are congruent with strategic analysis</i></b> <ul style="list-style-type: none"> <li>Specific recommendations and/or plans of action provided.</li> <li>Specific data or facts were referred to when necessary to support the analysis and conclusions.</li> <li>Recommendations and conclusions were presented and supported in a literate and effective manner.</li> </ul>  | 20% | Effective recommendations and/or plans of action not provided.<br><br>Specific data or facts necessary to support the analysis and conclusions was not provided.         | Effective recommendations and/or plans of action inadequate.<br><br>Specific data or facts were not referred when necessary to support the analysis and conclusions. | Effective recommendations and/or plans of action were partially provided.<br><br>Specific data or facts were occasionally referred when necessary to support the analysis and conclusions. | Effective recommendations, solutions, and/or plans of action were provided.<br><br>Specific data or facts were referred when necessary to support the analysis and conclusions. |

|  |     |   |  |   |  |
|--|-----|---|--|---|--|
| <b>Presentation: Proper organization, professional writing, and logical flow of analysis. APA formatting</b> | 20% | <p>Key points were poorly identified and supported with a well thought out rationale based on applying specific concepts or analytical frameworks to the data provided in the case.</p> <p>Grammar, spelling, punctuation, professional writing, and syntax needs significant improvement</p> | <p>Key points were not identified and supported with a well thought out rationale based on applying specific concepts or analytical frameworks to the data provided in the case.</p> <p>Grammar, spelling, punctuation, professional writing, and syntax needs improvement</p> | <p>Key points were partially identified and supported with a well thought out rationale based on applying specific concepts or analytical frameworks to the data provided in the case.</p> <p>Adequate grammar, spelling, punctuation, professional writing, and syntax</p> | <p>Key points were clearly identified and supported with a well thought out rationale based on applying specific concepts or analytical frameworks to the data provided in the case.</p> <p>Excellent grammar, spelling, punctuation, professional writing, and syntax</p> |
|--|-----|---|--|---|--|

### SEMESTER - III

| Semester                          | III  | Course Code | 3P1             | Type of Course | Core/ Elective  |  |  |
|-----------------------------------|--|-------------|-----------------|----------------|-----------------|--|--|
| Course Name                       | <b>SUMMER INTERNSHIP PROJECT (SPECIALIZATION BASED)</b>  |             |                 |                |                 |  |  |
| Credits                           | 6  |             | Number of days: |                | <b>45 to 60</b> |  |  |
| <b>Detailed Course Objectives</b> |  |             |                 |                |                 |  |  |
| CO1                               | Student is able to <b>construct</b> the company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for his / her organization of internship.   |             |                 |                |                 |  |  |
| CO2                               | For his / her organization of internship, the student is able to <b>assess</b> its Strengths, Weaknesses, Opportunities and Threats (SWOT). Student is able to <b>determine</b> the challenges and future potential for his / her internship organization in particular and the sector in general. |             |                 |                |                 |  |  |
| CO3                               | Student is able to <b>test</b> the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period.  |             |                 |                |                 |  |  |
| CO4                               | Student is able to <b>apply</b> various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.   |             |                 |                |                 |  |  |
| CO5                               | Student is able to <b>analyze</b> the functioning of internship organization and <b>recommend</b> changes for improvement in processes.  |             |                 |                |                 |  |  |

## GENERAL RULES & GUIDELINES

- At the end of second semester, all students will have to undergo summer training of 6-8 weeks with an industrial, business or service organization by taking up a Summer Internship Project (SIP).
- The condition of successfully completing the program shall not be deemed to have been satisfied unless a student undergoes summer training under the supervision of the department in organizations as approved by the Director/ Principal/ Head / Faculty from time to time.
- Alternatively Director/ Principal/ Head / Faculty of the Department/ College/ Institute may allocate the sector/ industry/ company specific project to the individual student.
- Each student will be required to give a presentation to the Department/ College/ Institute on the project undertaken during the SIP. The presentations should be scheduled within FOUR weeks of commencement of the third semester for the purpose of evaluation in the third semester. (Suggested Annexure II)
- Each student will be required to submit a project report as per format suggested in Annexure I to the Department/ College/ Institute for the work undertaken during this period within SIX weeks of commencement of the third semester for the purpose of evaluation in the third semester.
- Each student will be required to submit a feedback report from the SIP organisation as suggested in Annexure III to the Department/ College/ Institute.
- Evaluation of the SIP presentations shall be done jointly by one industry professional and one faculty member of the Department/ College/ Institute as per suggested criteria in Annexure IV.
- Evaluation of the SIP Report shall be done jointly by two faculty members of the Department/ College/ Institute as per suggested criteria in Annexure V.

## EVALUATION SCHEME

- TOTAL MARKS FOR SIP = 100 MARKS (50 marks for presentation + 50 marks for the report).

## ANNEXURE I - FORMAT FOR SUMMER PROJECT REPORT

- **Title Page:** including the project title, Student's name, name of the SIP organization, Name of the supervisor from SIP organisation, Name of the guide from Department/ College/ Institute and month and year of submission.
- **Certificate from the Department/ College/ Institute:** "This is to certify that the investigation described in this report titled "**Summer Project Report Title**" has been carried out by **Mr / Ms. Student's Name** during the summer internship project. The study was done in the organisation, **SIP Company Name**, in partial fulfilment of the requirement for the degree of Master of Business Administration of R. T. M. Nagpur University, Nagpur. This work is the own work of the candidate, complete in all respects and is of sufficiently high standard to warrant its submission to the said degree. The assistance and resources used for this work are duly acknowledged."
- **Certificate from the SIP organisation:** A copy of the certificate specifying that the student has successfully completed the summer project

for the prescribed duration.

- **Acknowledgements page:** Acknowledging persons, organisations and other resources which were instrumental in completion of student's summer training.
- **Table of contents or index page.**
- **Part 1 (A) Company Profile:** Brief history, Management structure, Achievements, awards and latest developments, Products & Services offered, Performance & Market share, SWOT analysis.
- **Part 1 (B) Sector Overview:** Sector size and major players, Regulations and regulatory bodies, Sector's contribution to economy, Problems faced by the sector in general and the company in particular, Future potential of the sector.
- **Part 2 (A) Actual Work Done:** Week wise details of the work done including the details of any specific tasks or projects assigned by the company, Key learning week-wise, (If a specific project was allotted to you then you need to prepare the following: 1. Title of the project allotted, 2. Objectives of the project, 3. Research methodology adopted – Sampling method and sample size, data collection tools used, etc. 3. Analysis and interpretation of the data collected)
- **Part 2 (B) Findings and Suggestions.**
- **Part 2 (C) Conclusion.**
- **Appendices.**
- **Bibliography.**

- **Size of Report:** 25 to 35 pages
  - **Paper Size:** A 4
  - **Binding Types:** Paperback (Spiral)
  - **No. of Copies:** TWO (One to be submitted to the Department/ College/ Institute for record & one to be returned back to the student after evaluation).
  - **Font Type:** Times New Roman
  - **Font Size:** Headings 14, Text 12
- Line Spacing:** Single spacing.

## ANNEXURE II - FORMAT FOR SUMMER PROJECT PRESENTATION

- **Title Slide 1:** The project title, Student's name, name of the SIP organization, Name of the supervisor from SIP organisation, Name of the guide from Department/ College/ Institute.
- **Slide 2:** About the company - its products & services, Sector size and major players.
- **Slide 3:** Performance & Market share.
- **Slide 4:** Problems faced by the sector in general and the company in particular.
- **Slides 5 to 7:** Week wise details of the work done including the details of any specific tasks or projects assigned by the company.
- **Slide 8:** Key learning.
- **Slide 9:** Findings and Suggestions.
- **Slide 10:** Conclusion.

Each Student shall make a presentation for duration of maximum 10 minutes which shall be followed by a question and answer session of maximum 5 minutes.

### **ANNEXURE III - SIP ORGANISATION FEEDBACK**

**Feedback to be solicited from the SIP organisation to rate the student on a scale of 1-10 (1 being poor and 10 being excellent) for the below mentioned parameters:**

1. KNOWLEDGE OF SUBJECT / DOMAIN AREA.
2. PUNCTUALITY.
3. ATTITUDE.
4. COMMUNICATION SKILLS – ORAL.
5. COMMUNICATION SKILLS – WRITTEN.
6. ACCOMPLISHMENT OF THE ASSIGNED TASKS.
7. CONFIDENCE LEVEL.
8. GENERAL AWARENESS.
9. GRASPING ABILITY.
10. OVERALL PERSONALITY.

### **ANNEXURE IV - EVALUATION PARAMETERS FOR SIP PRESENTATION**

**Evaluation of the student's presentation to be done on a scale of 1-10 (1 being poor and 10 being excellent) for the below mentioned parameters:**

1. COMPANY & SECTOR ANALYSIS.
2. ATTEMPT TO RELATE PRACTICAL WORK WITH THEORY.
3. KEY LEARNINGS AND RECOMMENDATIONS.
4. HANDLING QUESTIONS.
5. OVERALL QUALITY OF PRESENTATION.

### **ANNEXURE V - EVALUATION RUBRIC FOR SIP REPORT**

**RUBRIC FOR SUMMER INTERNSHIP REPORT ASSESSMENT.**

**NAME OF THE STUDENT:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

| <b>CRITERION</b>  | <b>SUBSTANTIAL<br/>ACHIEVEMENT<br/>(8-10 Marks)</b>  | <b>MODERATE<br/>ACHIEVEMENT<br/>(5-7 Marks)</b>   | <b>POOR<br/>ACHIEVEMENT<br/>(0-4 Marks)</b>  |
|---|--|---|--|
| <b>Description of Organizational Profile</b>                | Writes a clear description of company profile including its history, management structure, products / services offered, key achievements and market performance                        | Writes a limited description of company profile. However a majority of the points are covered.  | Writes a very brief description of company profile excluding majority of the points.   |
| <b>Analysis of organization &amp; Sector.</b>               | Performs a SWOT analysis for the company and presents all the key challenges & opportunities of the sector in general and company in particular.                                       | A limited analysis of the company and the sector is performed. All the key elements of challenges & opportunities have not been identified.   | Is unable to perform a proper SWOT analysis and identify the challenges & opportunities of the sector in general and company in particular.  |
| <b>Application of theoretical knowledge.</b>                | Details of the work done or project implemented during Internship is documented in detail. Theoretical basis is used to identify the various issues in organization and its processes. | Work done or project implemented during Internship is documented but with limited details. No proper theoretical basis for identification of issues in organization and its processes.                      | Documentation of work done or project implemented during Internship is vaguely defined. No attempt has been made to relate theory with organizational or procedural problems.                |
| <b>Conclusions and Recommendations</b>                      | Conclusions drawn are not global but specific & based on empirical evidences. Recommendations given are practical and feasibility & methodology of implementing the same is discussed. | Conclusions drawn are specific but empirical evidences are not properly presented. Recommendations given seem to be practical and feasible. However, methodology of implementing the same is not discussed. | Conclusions drawn are of global nature not based on empirical evidences. Recommendations given don't seem practical and feasibility & methodology of implementing the same is not discussed. |
| <b>Feedback from organization.</b>                          | A positive and high score of feedback is received on most of the parameters from the SIP organization.   | An average and moderate score of feedback is received on most of the parameters from the SIP organization.  | A low and poor score of feedback is received on most of the parameters from the SIP organization. (or feedback not submitted)  |
| <b>Total Points Scored<br/>(Out of 50 maximum possible)</b> |  | →   |  |
| <b>Faculty 1 Initials</b>                                   | <b>Faculty 1 Signature</b>   | <b>Faculty 2 Initials</b>   | <b>Faculty 2 Signature</b>   |

| Semester                          | <b>III</b>   | Course Code      | <b>3T1</b> | Type of Course | <b>Elective</b>                                     |  |  |  |
|-----------------------------------|--|------------------|------------|----------------|---|--|--|--|
| Course Name                       | <b>MM1: SALES AND DISTRIBUTION MANAGEMENT</b>  |                  |            |                |   |  |  |  |
| Credits                           | <b>4</b>   | Number of hours: | <b>40</b>  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |            |                |   |  |  |  |
| <b>CO1</b>                        | Given a situation, student manager will be able to <b>identify</b> appropriate Sales Forecasting method to be adopted by a company.  |                  |            |                |   |  |  |  |
| <b>CO2</b>                        | Given a situation of newly launched company, student manager will be able to <b>design</b> an effective Sales Compensation Plan for Sales Executive.   |                  |            |                |   |  |  |  |
| <b>CO3</b>                        | Given a situation of distribution channel of a company, student manager will be able to <b>outline</b> different levels of Marketing channel used by the company.  |                  |            |                |   |  |  |  |
| <b>CO4</b>                        | Given a situation, student manager will be able to <b>describe</b> the process of Supply Chain and Reverse Logistics.  |                  |            |                |   |  |  |  |
| <b>CO5</b>                        | Given a situation, student manager will be able to <b>develop</b> e-retailing strategy as a channel of distribution.   |                  |            |                |   |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |            |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| <b>Module 1</b>                   | <b>Introduction to Sales Management</b> - Definition and meaning, Objectives, Sales Research, Sales Forecasting, Sales Forecasting methods, Sales Planning and control: Goal setting, Performance measurement, diagnosis and corrective actions, Estimating market and Sales Potentials  |                  |            |                |   |  |  |  |
| <b>Module 2</b>                   | <b>Sales Organisation</b> - Setting up a sales organization, Personal Selling, Management of Sales force, Recruitment & Selection, Training, Motivation and Evaluation, Compensating Sales Force, Territory Management, Sales Budget, Sales Quota.   |                  |            |                |   |  |  |  |
| <b>Module 3</b>                   | <b>Physical Distribution</b> - Definition, Importance - participants in physical distribution process - Different forms of channels - Functions of Marketing Channels, Unconventional channels - Channel Intermediaries - Wholesaling and Retailing , Channels for Consumer goods, Industrial Goods & Services - Integrated Marketing Channels - |                  |            |                |   |  |  |  |

|                                   |  |  |
|-----------------------------------|--|--|
|                                   | Horizontal, Vertical, Multi -channel marketing Systems.  | ISBN 978-81-317-1089-0, Chapter 9  |
| Module 4                          | <b>Supply Chain Management</b> - concept - significance - components - Order processing - Material Handling - Transportation - Warehousing - Inventory Management - Reverse Logistics, E-enabled selling and distribution  | Sales Distribution Management, K. Shridhara Bhat, Himalaya Publishing House Pvt Ltd, ISBN Number : 978-93-5051-411-5, Chapter 9-14,16              |
| Module 5                          | <b>E-commerce and e-retailing</b> - E-commerce and e-retailing as a channel of distribution, Electronic intermediaries, Disintermediation and Re-intermediation, e-enabled logistics management and tracking systems.  | Retail Management: Functional Principles and Practices, Gibson G. Vedamani, 5 <sup>th</sup> Edition, Pearson, ISBN – 978-93-868-7327-9, Chapter 29 |
| Other Reference books and sources | 1. Sales and Distribution Management: Text and Cases, 3rd Edition, Krishna K Havaldar & Vasant M Cavale, McGraw Hill Education, ISBN-13: 978-9352607730<br>2. Sales and Distribution Management, 2nd Edition, Tapan K Panda & Sunil Sahadeva, Oxford; ISBN-13: 978-0198077046<br>3. Sales and Distribution Management: A Practice based approach, Ramendra Singh, Vikas Publishing, ISBN-13: 978-9325994065<br>4. Sales Management: Concepts and Cases, 10ed, ISV, William L. Cron & Thomas E. Decarlo, Wiley, ISBN-13: 978-8126526383 |  |

| Semester                          | III  | Course Code      | 3T2 | Type of Course | Elective |  |  |  |  |
|-----------------------------------|--|------------------|-----|----------------|----------|--|--|--|--|
| Course Name                       | <b>MM2: DIGITAL AND SOCIAL MEDIA MARKETING</b>   |                  |     |                |          |  |  |  |  |
| Credits                           | 4  | Number of hours: |     | 40             |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |                |          |  |  |  |  |
| CO1                               | On studying this module, the students will be able to <b>understand</b> the concept of marketing in digital environment. They will also be able to <b>relate</b> traditional |                  |     |                |          |  |  |  |  |

|  | marketing concepts with digital marketing and evaluate the use of various channel options available for digital marketing.  |   |
|--|---|---|
| CO2  | On completing this module, the students will <b>develop</b> the concept of digital marketing research. They will also be able to <b>examine</b> online consumer behaviour and imagine its utility in online/offline marketing strategies  |   |
| CO3  | Upon studying this module, the students will be able to <b>build</b> an understanding of search engines and their utility in digital marketing area. They will also <b>comprehend</b> optimization and the keyword search methodology.  |   |
| CO4  | On properly studying this module, the student will be able to <b>examine</b> the utility of different social media in digital marketing and <b>evaluate</b> their use, as future managers, in actual marketing campaigns.   |   |
| CO5  | On studying this module, the student will be able to <b>create</b> favourable online reputation, later, as future managers, for organizations they serve. Students will also be able to <b>form</b> opinion on current trends in digital marketing area and <b>estimate</b> future trends therein.  |   |
| Detailed Contents:                           |   |   |
| Reference Book, Publisher, Edition, Page No. |   |   |
| Module 1                                     | <b>Introduction:</b> Digital Marketing and its Significance. Traditional marketing V/s digital marketing. Marketing in digital environment, Introduction to E-commerce, types of E-commerce & business models, advantages & Disadvantages, hybrid & multi-channel options, online media and types.  | Digital Marketing, Raghavendra K., Shruti Prabhakar, Himalaya Publ. House, 2016, page no. 1-79            |
| Module 2                                     | <b>Digital marketing research:</b> Features of marketing research, steps in marketing research, methods of digital marketing research, audience profiling and segmentation. The internet: uses, purposes, online consumer behaviour, direct marketing. Online research methods, behavioural targeting, blogs and types, building customer profiles, competitor analysis, integrating online strategies, offline marketing strategies. | Digital Marketing, Raghavendra K., Shruti Prabhakar, Himalaya Publ. House, 2016, page no. 96-147, 155-174 |
| Module 3                                     | <b>Search Engine Marketing:</b> Introduction, email campaign creation and management, search and display on search engines, pricing models, page rankings, search engine optimization (SEO) and process, key words, search engine marketing (SEM), paid and natural search, search methodology.   | Digital Marketing, Raghavendra K., Shruti Prabhakar, Himalaya Publ. House, 2016, page no. 179-252.        |
| Module 4                                     | <b>Social Media:</b> Introduction to social media, Facebook, Linkedin, Twitter, Youtube, creating a channel on Youtube, social media measuring, forums and discussion boards, forums and communities, blogs, viral campaigns, building online relationships with different stakeholders.  | Digital Marketing, Raghavendra K., Shruti Prabhakar, Himalaya Publ. House, 2016, page no. 257-324.        |

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|-----------------------------------|---|--|
|                                   |   | The Ultimate Web Marketing Guide, Michael Miller, Pearson, page no.315-343.                                |
| Module 5                          | <b>Online Reputation and Recent Trends:</b> Introduction, reputation management process, features of online reputation management, strategies and tools of online reputation management, handling negative comments, recent trends in digital marketing, localization of content and advertising, marketing using mobile networks, journey from traditional to mobile banking, consumer engagement and methods. | Digital Marketing, Raghavendra K., Shruti Prabhakar, Himalaya Publ. House, 2016, page no.329-348, 353-380. |
| Other Reference books and sources | 1. Internet Marketing: Start to Finish, Catherine Joun, Dunlie Greiling, Pearson, 2012.<br>2. Facebook Marketing: Designing Your Next Marketing Campaign, Justin Levy, Pearson, 2011.<br>3. Advertising, Promotion and other Aspects of Marketing, Terence Shimp, Craig Andrews, Cengage Learning, 2016.<br>4. Online Retailing: A New Paradigm, The ICFAI University Press, 2008.                              |  |

| Semester                          | III  | Course Code      | 3T3 | Type of Course                                  | Elective |  |  |  |  |
|-----------------------------------|--|------------------|-----|---|----------|--|--|--|--|
| Course Name                       | <b>MM3: INTEGRATED MARKETING COMMUNICATION AND BRAND MANAGEMENT</b>  |                  |     |   |          |  |  |  |  |
| Credits                           | 4  | Number of hours: |     | 40  |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |   |          |  |  |  |  |
| CO1                               | At the end of the course the student manager shall be able to <b>Design</b> the Integrated marketing communication Process for a company/product   |                  |     |   |          |  |  |  |  |
| CO2                               | At the end of the course the student manager shall be able to <b>develop</b> a creative message strategy for a product and execute it.   |                  |     |   |          |  |  |  |  |
| CO3                               | At the end of the course the student manager shall be able to <b>implement</b> and evaluate a IMC campaign.  |                  |     |   |          |  |  |  |  |
| CO4                               | At the end of the course the student manager shall be able to <b>Identify&amp;Establish</b> Brand Positioning for a given product  |                  |     |   |          |  |  |  |  |
| CO5                               | At the end of the course the student manager shall be able to <b>design/develop</b> branding strategies for a product/company, brand marketing program and shall be able to evaluate a branding program. |                  |     |   |          |  |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |     | <b>Reference Book, Publisher, Edition, Page</b> |          |  |  |  |  |

|  |   | No.   |
|--|---|---|
| <b>Module 1</b>                          | Marketing Communication: Introduction, Objectives, using MC to build brand, Introduction to IMC: concepts, IMC partners & industry organisation.<br><br>How brand communication works, How brand decision makers respond to MC messages. IMC planning process   | Principles of Advertising & IMC, Tom Duncan , McGraw-Hill , second edition page 1-190               |
| <b>Module 2</b>                          | Creating Sending & Receiving IMC messages - How to develop creative message strategy, how to get a big idea; Message execution.   | Principles of Advertising & IMC, Tom Duncan , McGraw-Hill , second edition page 263-321             |
| <b>Module 3</b>                          | Media planning : Media classifications, Advertising & IMC Media Planning, consumer sales promotion, trade promotion, Personal selling ,Public relations, direct marketing, event marketing and customer services; Evaluating IMC campaigns  | Principles of Advertising & IMC, Tom Duncan , McGraw-Hill , second edition page 330-601             |
| <b>Module 4</b>                          | Brand Management & Brand Equity: Meaning, Scope of Brand, Brand Management. Branding Challenges & opportunities. Strategic Brand Management - need & process. Identifying & Establishing Brand Positioning & Values-Brand Equity, customer based brand equity, brand positioning.   | Strategic Brand Management , Third edition , Kelvin Lane Keller, Pearson Education, Page No.23-160  |
| <b>Module 5</b>                          | Planning & implementing brand marketing program, Measuring & implementing brand performance   | Strategic Brand Management , Third edition , Kelvin Lane Keller, Pearson Education, Page No.161-424 |
| <b>Other Reference books and sources</b> | 1. Advertising & IMC: Principles and Practice, 10th Edition, Sandra Moriarty, Nancy Mitchell, William Wells, Pearson, ISBN-13: 978-0133506884<br><br>2. Product and Brand Management, Tapan Panda, Oxford University Press; First edition, ISBN-13: 978-0199460496<br><br>3. Principles of Integrated Marketing Communications, Lawrence Ang, Cambridge University Press; 1 edition, ISBN-13: 978-1107649187<br><br>4. Advertising and Promotion: An Integrated Marketing Communications Perspective (SIE), McGraw Hill Education; Ninth edition, ISBN-13: 978-1259026850 |   |

| Semester | III | Course Code | 3T1 | Type of Course | Elective |
|----------|-----|-------------|-----|----------------|----------|
|----------|-----|-------------|-----|----------------|----------|

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|----------------------------|---|--|--|
| Course Name                | FM1: INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT   |  |  |
| Credits                    | 4   | Number of hours:                             | 40   |
| Detailed Course Objectives |   |  |  |
| CO1                        | The student will be able to <b>apply</b> concept of time value of money in computing the value of fixed income securities. The student will also be able to <b>understand</b> the relationship between interest rates, yield and bond prices.   |  |  |
| CO2                        | The student will be able to <b>compute and compare</b> the value of a company's equity share with other company's equity by using various methods and tools of equity valuation   |  |  |
| CO3                        | The student will be able to <b>build and evaluate</b> the relationship between the concept of risk and return and will be able to <b>relate</b> its implication on creating portfolio.  |  |  |
| CO4                        | The student will be able to <b>learn</b> the theoretical concepts of underlying the portfolio creation  |  |  |
| CO5                        | The student will be able to <b>assess</b> the tools and strategies for portfolio creation and evaluation and will also be able to <b>evaluate</b> the portfolios of mutual funds by using the tools of portfolio evaluation   |  |  |
| Detailed Contents:         |   | Reference Book, Publisher, Edition, Page No. |  |
| Module 1                   | <b>FIXED-INCOME VALUATION:</b> Introduction. <i>Bond Prices and the Time Value of Money:</i> Bond Pricing with a Market Discount Rate, Yield-to-Maturity, Relationships between the Bond Price and Bond Characteristics. <i>The Maturity Structure of Interest Rates. Yield Spreads:</i> Yield Spreads over Benchmark Rates, Yield Spreads over the Benchmark Yield Curve.  |  | Investment Analysis & Portfolio Management - Prasanna Chandra, Tata McGraw Hill Publications, Chapter - 11 |
| Module 2                   | <b>EQUITY VALUATION - CONCEPTS AND BASIC TOOLS:</b> Introduction. Estimated Value and Market Price. Major Categories of Equity Valuation Models: <i>Present Value Models:</i> The Dividend Discount Model; Background and Description of the Dividend Discount Model. The Gordon Growth Model, Multistage Dividend Discount Models. <i>Multiplier Models:</i> Relationships among Price Multiples, Present Value Models, and Fundamentals; The Method |  | Investment Analysis & Portfolio Management - Prasanna Chandra, Tata McGraw Hill Publications, Chapter - 13 |

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|-----------------------------------|---|---|
|                                   | of Comparables; Illustration of a Valuation Based Roon Price Multiples; Enterprise Value.<br><b><i>Asset-Based Valuation</i></b>  |   |
| Module 3                          | <b>PORTFOLIO RISK AND RETURN – PART I:</b> The Concept of Market Efficiency, Forms of Market Efficiency , Random Walk Theory, <b><i>Investment Characteristics of Assets:</i></b> Return, Other Major Return Measures and their Applications, Variance and Covariance of Returns, Historical Return and Risk, Other Investment Characteristics. <b><i>Portfolio Risk:</i></b> The Concept of Risk Aversion, Portfolio of Two Risky Assets, Portfolio of Multiple Risky Assets, The Power of Diversification.  | Investment Analysis & Portfolio Management - Prasanna Chandra, Tata McGraw Hill Publications, Chapter – 4 & 7 |
| Module 4                          | <b>PORTFOLIO RISK AND RETURN – PART II:</b> <b><i>Efficient Frontier and Investor's Optimal Portfolio:</i></b> Investment Opportunity Set, Minimum-Variance Portfolios, A Risk-Free Asset and Multiple Risky Assets, Optimal Investor Portfolio, <b><i>Capital Market Theory:</i></b> Portfolio of Risk-Free and Risky Assets, The Capital Market Line. <b><i>Pricing of Risk and Computation of Expected Return:</i></b> Systematic Risk and Non-systematic Risk, Calculation and Interpretation of Beta. <b><i>The Capital Asset Pricing Model:</i></b> Assumptions of the CAPM, The Security Market Line, Applications of the CAPM - | Investment Analysis & Portfolio Management - Prasanna Chandra, Tata McGraw Hill Publications, Chapter – 8     |
| Module 5                          | <b>PORTFOLIO MANAGEMENT</b> – Specification of Investment Objectives and Constraints, Selection of Asset Mix,Formulation of Portfolio Strategy, Selection of Securities, Portfolio Execution, Portfolio Revision, Performance Evaluation, Portfolio and Mutual fund Performance evaluation – Sharpe Ratio, Treynor Ratio, Jensen's Alpha, Sortino Ratio and M <sup>2</sup> .  | Investment Analysis & Portfolio Management - Prasanna Chandra, Tata McGraw Hill Publications, Chapter – 21    |
| Other Reference books and sources | 1. Security Analysis and Portfolio Management, S. Kevin, 2d Edition, PHI Learning, ISBN-13: 978-8120351301<br>2. Security Analysis and Portfolio Management, 6e, Donald E. Fischer & Ronald J. Jordan, Pearson Education India, ISBN-13: 978-8177588118<br>3. Security Analysis and Portfolio Management, M. Ranganathan & R. Madhumathi, 2nd edition, Pearson Education India ISBN-13: 978-8131759202<br>4. Securities Analysis and Portfolio Management, V. A. Avadhani, 12th Edition, Himalaya Publishing House, ISBN-13: 978-9352029921   |   |

| Semester | III | Course Code | 3T2 | Type of Course | Elective |
|----------|-----|-------------|-----|----------------|----------|
|----------|-----|-------------|-----|----------------|----------|

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|-----------------------------------|---|---|-----------|
| <b>Course Name</b>                | <b>FM2: PROJECT APPRAISAL AND FINANCE</b>   |   |           |
| <b>Credits</b>                    | <b>4</b>  | <b>Number of hours:</b>   | <b>40</b> |
| <b>Detailed Course Objectives</b> |   |   |           |
| <b>CO1</b>                        | The student will be able to <b>assess</b> capital budgeting decisions under uncertain and risk bearing situation and will also be able to <b>build</b> and <b>interpret</b> the decision tree approach for decision making  |   |           |
| <b>CO2</b>                        | The student will be able to <b>choose</b> between acquisition of long term assets either through lease or financing methods and will also be able to <b>learn</b> process of Private Equity and Venture Capital   |   |           |
| <b>CO3</b>                        | The student will be able to <b>compare</b> the various theories of capital structure and will be able to <b>determine</b> the impact of debt equity mix on value of firm  |   |           |
| <b>CO4</b>                        | The student will be able to <b>evaluate</b> and <b>compare</b> the pre and post merger financial position of the firms.   |   |           |
| <b>CO5</b>                        | The student will be able to <b>determine/ estimate</b> the cash requirement in a firm and will also be able to <b>evaluate</b> the impact of trade receivable policy of a firm on its profitability.  |   |           |
| <b>Detailed Contents:</b>         |   | <b>Reference Book, Publisher, Edition, Page No.</b>   |           |
| <b>Module 1</b>                   | <b>Long-term Investment Decisions:</b> Capital Budgeting—Identification of Cash Flows and evaluation of proposals, Risk and Uncertainty Analysis, Certainty Equivalent Approach, Sensitivity Analysis, Probability Distribution Approach and Decision Tree Approach                               | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition<br>Financial Management, Theory, Concepts and Problem, Taxmann Publications, 5 <sup>th</sup> Edition, ISBN: 9788171949311, Chapter 9 |           |
| <b>Module 2</b>                   | <b>Leasing, Hire-purchase &amp; Project Finance</b> —Types of leases, rationale for leasing, Mechanics of leasing, Operating lease, Leasing as financial decision, Lease Vs borrow & buy evaluation, Hire purchase arrangement, Choice between leasing & hire purchase, Project finance – Private | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition<br>Financial Management, Theory, Concepts  |           |

|                                   |  |   |
|-----------------------------------|--|---|
|                                   | Equity, Venture Capital.   | and Problem, Taxmann Publications, 5 <sup>th</sup> Edition, ISBN: 9788171949311, Chapter 24,25  |
| Module 3                          | <b>Capital structure &amp; Value of firm</b> - Assumptions & definitions, NI approach, NOI approach, Traditional Position, MM position, Taxation & capital structure, Trade off theory, Signaling theory , Pecking order theory, Factors determining Capital Structure, Financial Distress, Project Financing and Project Beta   | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition<br>Financial Management, Theory, Concepts and Problem, Taxmann Publications, 5 <sup>th</sup> Edition, ISBN: 9788171949311, Chapter 13&14 |
| Module 4                          | <b>Mergers &amp; Acquisitions</b> – M & A -Exchange ratio Financial evaluation of mergers, M&A as capital budgeting decision, Economic value added & market value added Taxation aspects.  | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition<br>Financial Management, Theory, Concepts and Problem, Taxmann Publications, 5 <sup>th</sup> Edition, ISBN: 9788171949311, Chapter 30    |
| Module 5                          | <b>Management of Cash</b> - Motives of holding cash, factors determining the cash balance, Managing the cash flow, Cash budget, Reports for control, Cash collection & disbursement, Options for investing surplus funds & strategies for managing surplus funds, Models- The Baumol model, The Beranek Model, The Miller-Orr Model. <b>Management of Receivables</b> - Credit policies, Evaluating the debtors, Credit analysis & decision, Credit terms & collection policies, Control of accounts receivables, Heuristic approach, Factoring and forfaiting | Financial Management, M. Y. Khan & P. K. Jain, McGraw Hill Publications, 6 <sup>th</sup> Edition<br>Financial Management, Theory, Concepts and Problem, Taxmann Publications, 5 <sup>th</sup> Edition, ISBN: 9788171949311, Chapter 19&20 |
| Other Reference books and sources | 1. Financial Management, I M Pandey, 10 <sup>th</sup> Edition, Vikas Publishing House Pvt Ltd, ISBN: 9788125937142<br>2. Financial Management, Comprehensive Text book with Case studies, M. Ravi Kishore, 7 <sup>th</sup> Edition, Taxmann Publications, ISBN: 9788171945207<br>3. Financial Management: Theory and Practice, Prasanna Chandra, 9 <sup>th</sup> Edition, ISBN-13: 978-9339222574<br>4. Financial Management: Problems & Solutions, AN Sridhar and Padmavati Sridhar, 5 <sup>th</sup> Edition, Packt Publishers, ISBN: 9789350238929           |   |

| Semester                          | III   | Course Code      | 3T3 | Type of Course | Elective  |  |  |  |
|-----------------------------------|---|------------------|-----|----------------|---|--|--|--|
| Course Name                       | <b>FM3: FINANCIAL DERIVATIVES</b>   |                  |     |                |   |  |  |  |
| Credits                           | 4   | Number of hours: | 40  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |   |                  |     |                |   |  |  |  |
| CO1                               | The student will be able to <b>describe</b> the concepts of derivatives and its trading and settlement procedures   |                  |     |                |   |  |  |  |
| CO2                               | The student will be able to <b>calculate</b> the value of Futures and <b>apply</b> it for risk managed trading strategies.  |                  |     |                |   |  |  |  |
| CO3                               | The student will be able to <b>compute</b> the value of Options and <b>plan</b> various option strategies.  |                  |     |                |   |  |  |  |
| CO4                               | The student will be able to <b>analyse and use</b> the concept of Swaps and will also be able to make Swaps related decisions.  |                  |     |                |   |  |  |  |
| CO5                               | The student will be able to <b>relate</b> concept of foreign exchange in currency conversion and <b>apply</b> currency forward rate agreements for hedging.   |                  |     |                |   |  |  |  |
| <b>Detailed Contents:</b>         |   |                  |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| Module 1                          | <b>Introduction to Derivatives Trading and Settlement</b> - Introduction to risk management, managing risk, types of business risks, derivatives and derivative products, classification of derivatives, participants in derivative market, functions of derivatives Trading of Derivatives Contracts Futures and Options Trading System, The Trader Workstation, Futures and Options Market Instruments, Criteria for Stocks and Index Eligibility for Trading, Charges ; Clearing and Settlement - Clearing Entities, Clearing Mechanism, Settlement Procedure, Risk Management, Margining System |                  |     |                |   |  |  |  |
| Module 2                          | <b>Equity Futures Derivatives and Trading Strategies</b> - Types of Futures - On the basis of Maturity, On the basis of the underlying asset; Margining in the Futures market; Terminologies used in the Futures Market; Futures Pricing – Cost of Carry Model; Trading Strategies using futures.   |                  |     |                |   |  |  |  |

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|----------|--|--|
|          |  | Options, Futures and Other Derivatives, J.C. Hull and Sankarshan Basu, 7 <sup>th</sup> Edition, Pearson Publishing, ISBN -978-81-317-2358-6, Chapter 5<br><br>NISM - Equity Derivative Module Study Material, Taxmann Publication, ISBN No.:9789387957084, Unit 3  |
| Module 3 | <b>Option Derivatives and Trading Strategies using options</b> – Types of Options - Call Options, Put Options; Option Pay-Offs; Terminologies used in the Options Market; Option Pricing – Binomial Model and Black & Scholes Model; Trading Strategies using options- caps, collars, butterfly, straddle, strangle etc. Option Greeks.                      | Derivatives and Risk Management, Rajiv Srivastav, 2 <sup>nd</sup> Edition, Oxford Higher Education Publishing, ISBN: 9780198089155, chapter 8,10,11&12<br><br>Options, Futures and Other Derivatives, J.C. Hull and Sankarshan Basu, 7 <sup>th</sup> Edition, Pearson Publishing, ISBN -978-81-317-2358-6          |
| Module 4 | <b>Swaps</b> - Concept and Characteristics; Types of Swaps – Interest Rate Swaps and Currency Swaps; Structure of Interest Rate Swaps and Intermediated Interest Rate Swaps; Relation between Interest Rate Swaps and Forward Rate Agreements; Calculations on Swaps.  | Derivatives and Risk Management, Rajiv Srivastav, 2 <sup>nd</sup> Edition, Oxford Higher Education Publishing, ISBN: 9780198089155, Chapter 7<br><br>Options, Futures and Other Derivatives, J.C. Hull and Sankarshan Basu, 7 <sup>th</sup> Edition, Pearson Publishing, ISBN -978-81-317-2358-6, chapter 28,31,32 |
| Module 5 | <b>Foreign Exchange risk &amp; Corporate Exposure Management</b> – Types of Exposure – Transaction, Economic and Translation; Foreign Exchange Risk – Types, Risk Management Techniques – External and Internal. International portfolio diversification and transfer pricing, Currency Derivatives and its application, Risk Management practices in India. | Foreign Exchange – Practice, Concept and Control, C. Jeevanandam, Sultan Chand and Sons Publication, ISBN – 81-8054-717-1, Chapter 10,11,14  |
| Other    | 1. Financial Derivatives-Theory, Concepts and Problems, 2nd Edition, S.L. Gupta, PHI Learning Pvt Ltd, ISBN: 9788120353480   |  |

|                                    |   |
|------------------------------------|---|
| <b>Reference books and sources</b> | 2. Fundamentals of Financial Instruments: An Introduction to Stocks, Bonds, Foreign Exchange and Derivatives, Wiley, ISBN-13: 978-8126534043<br>3. Derivatives Principles and Practice, 1st Edition, Sundaram & Das, McGraw Hill Education, ISBN-13: 978-1259097096<br>4. Options Futures & Other Derivatives 9e, John C. Hull & Sankarshan Basu, Pearson Education India ISBN-13: 978-9332559417 |
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| Semester                          | III  | Course Code      | 3T1 | Type of Course                                      | Elective  |  |  |  |
|-----------------------------------|--|------------------|-----|---|---|--|--|--|
| Course Name                       | <b>HRM1: MANPOWER PLANNING, RECRUITMENT AND SELECTION</b>  |                  |     |   |   |  |  |  |
| Credits                           | 4  | Number of hours: | 40  |   |   |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |   |   |  |  |  |
| <b>CO1</b>                        | Students should be able to <b>explain</b> the factors affecting HRP and HRP process of an organisation.  |                  |     |   |   |  |  |  |
| <b>CO2</b>                        | Students should be able to <b>determine</b> the process of demand and supply forecasting while doing human resource planning.  |                  |     |   |   |  |  |  |
| <b>CO3</b>                        | Students should be able to <b>devise</b> the manpower plan for an organisation.  |                  |     |   |   |  |  |  |
| <b>CO4</b>                        | Students should be able to <b>formulate</b> Recruitment and Selection process on the basis of HRP.   |                  |     |   |   |  |  |  |
| <b>CO5</b>                        | Students should be able to <b>outline</b> the Recent Trends in Manpower Development and Planning   |                  |     |   |   |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |     | <b>Reference Book, Publisher, Edition, Page No.</b> |   |  |  |  |
| <b>Module 1</b>                   | Manpower Planning: Meaning of HRP, Factors Affecting Manpower Planning, Need for Manpower Planning, Process of Manpower Planning, Importance of Manpower Planning, Obstacles in Manpower Planning, Advantages of Manpower Planning, Successful Manpower Planning |                  |     |   | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac Graw Hill Publication Ch-4<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House Ch-4 |  |  |  |
| <b>Module 2</b>                   | Manpower Forecasting: Concept, Factors affecting HRP, HRP at different levels of management, Integration of strategic planning and HRP, Process of HRP – Introduction Demand Forecasting –   |                  |     |   | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac  |  |  |  |

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|--|---|--|
|  | Techniques of demand forecasting, Supply forecasting, Control and Review mechanism.   | Graw Hill Publication, Ch-4<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House Ch-4  |
| <b>Module 3</b>                          | Developing a Manpower Plan: Use of HRIS in HRP, HR Plan Implementation, Managerial Succession Planning, Requisites of Successful HRP, Recent Trends in HRP  | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac Graw Hill Publication, Ch 4<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House Ch 4           |
| <b>Module 4</b>                          | Recruiting & Selecting Human Resources- Sourcing of candidates, Recruitment, Factors governing recruitment, Strategic Management & Recruitment- Centralised & Decentralised Modern Sources and Techniques of Recruitment.<br><br>Selection- concept, Selection Process, use of Psychological tests, Types of tests, Psychometric tests, online test, Importance of tests, Interviews- interviewing skills, Evaluation of Selection Programs, Recent Trends in Selection. Barriers to effective selection, Ancillary Topics- Induction, Placement, Employer branding | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac Graw Hill Publication Ch 6,7, 8<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House Ch 5,6,29  |
| <b>Module 5</b>                          | Recent Trends in Manpower Planning: Introduction, E-Manpower planning, e-Recruitment, e-selection Competency mapping, Knowledge management, E-Manpower Development, Concept of Global Recruitment.  | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac Graw Hill Publication Ch.28,29<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House Ch.27,28,29 |
| <b>Other Reference books and sources</b> | 1. Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House<br>2. Manpower Planning and Recruiting: Including Induction, Iain Maitland, Infinity Books, ISBN-13: 978-8179291139<br>3. Recruitment and Selection: Theory and Practices, Dipak Kumar, Cenage Learning, ISBN-13: 978-8131531600<br>4. Human Resource Planning, 3rd Edition, Dipak Kumar Bhattacharya, Excel Books, ISBN-13: 978-9350620571  |  |

| Semester | III | Course Code | 3T2 | Type of Course | Elective |
|----------|-----|-------------|-----|----------------|----------|
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|-----------------------------------|---|---|---|
| <b>Course Name</b>                | <b>HRM2: PERFORMANCE MEASUREMENT SYSTEM</b>   |   |   |
| <b>Credits</b>                    | <b>4</b>  | <b>Number of hours:</b>                             | <b>40</b>   |
| <b>Detailed Course Objectives</b> |   |   |   |
| <b>CO1</b>                        | Students should be able to <b>distinguish</b> the concept of Performance appraisal & Performance Management and also should be able to establish relationship of performance management with Strategic Planning.  |   |   |
| <b>CO2</b>                        | Students should be able to <b>determine</b> the Mechanism of Performance Management, and also explain the various steps in performance planning and performance execution.  |   |   |
| <b>CO3</b>                        | Students should be able to <b>justify</b> the use of various modern and traditional methods of Performance Appraisal under given situation.   |   |   |
| <b>CO4</b>                        | Students should be able to <b>justify</b> the use of various Performance Assessment Models under given situations; also the student should be able to determine the steps of giving a constructive feedback.  |   |   |
| <b>CO5</b>                        | Students should be able to <b>discuss</b> the importance and Principles of ethics in performance management.  |   |   |
| <b>Detailed Contents:</b>         |   | <b>Reference Book, Publisher, Edition, Page No.</b> |   |
| <b>Module 1</b>                   | <i>Introduction to Performance Management:</i> Concept – Performance appraisal, Performance Management, Performance management system, Objectives and functions of Performance Management system, Linkage of Performance Management to strategic planning.  |   | Performance management – Herman Aguinis, Pearson publication, Ch 3<br>Performance management – A.S.Kohli & T.Deb, Oxford publication, Ch2,3 |
| <b>Module 2</b>                   | <i>Process of Performance Management:</i> Introduction to Performance Management Process, Performance Management Planning Process, Mechanism of Performance Management Planning and Execution.  |   | Performance management – Herman Aguinis, Pearson publication, Ch 2<br>Performance management – A.S.Kohli & T.Deb, Oxford publication, Ch 5  |
| <b>Module 3</b>                   | <i>Performance Appraisal:</i> Definitions & Objectives of PA and Characteristics of PA, Importance, Advantages & Disadvantages of PA, Process of PA, Pitfall of PA, Achieving effective PA, Methods of PA, <i>Performance Appraisal Methods:</i> Performance Appraisal Methods, Traditional Methods, Modern Methods |   | Performance management – A.S.Kohli & T.Deb, Oxford publication, Ch 7  |

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|--|---|---|
| <b>Module 4</b>                          | Models for Assessing Performance-Balance score card; Objectives and process of Performance monitoring, Performance management linked with reward systems. Building a High Performance culture-Performance Management & Employee Development.  | Performance management – Herman Aguinis, Pearson publication, Ch 8<br>Performance management – A.S.Kohli & T.Deb, Oxford publication, Ch 7,8,10 |
| <b>Module 5</b>                          | Ethics in Performance Appraisal: Ethics – An Overview, Ethics in Performance Management, Principles of ethical performance management Ethical issues and dilemmas in performance management   | Performance management – A.S.Kohli & T.Deb, Oxford publication, Ch 12   |
| <b>Other Reference books and sources</b> | 1. Human Resource Management: Text and Cases, V. S. P. Rao, Excel Books, ISBN-13: 978-8174464484<br>2. Human Resource Management: Text and Cases, 6th Edition, K. Aswathappa, McGraw Hill Education, ISBN-13: 978-0070682139<br>3. Human Resource Management, 15th Edition, Gary Dessler, Pearson Education, ISBN-13: 978-9352862658<br>4. Performance Management: Concepts, Skills and Exercises, 2nd Edition, Robert L Cardy & Brian Leonard, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120343238 |   |

| Semester    | III   | Course Code      | 3T3 | Type of Course | Elective |
|-------------|---|------------------|-----|----------------|----------|
| Course Name | <b>HRM3: COMPENSATION AND BENEFITS MANAGEMENT</b> |                  |     |                |          |
| Credits     | 4   | Number of hours: |     | 40             |          |

#### Detailed Course Objectives

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| <b>CO1</b> | Students should be able to <b>compare</b> the applicability of various Job Evaluation methods under given situations.                      |
| <b>CO2</b> | Students should be able to <b>determine</b> the importance of Wage Differentials and <b>Differentiate</b> between different types of wages |
| <b>CO3</b> | Students should be able to <b>align</b> the compensation strategy with business strategy   |
| <b>CO4</b> | Students should be able to <b>design and develop</b> the incentive and benefits plans  |
| <b>CO5</b> | Students should be able to <b>outline</b> the various Statutory Provisions related to Compensation   |

| Detailed Contents:                       |  | Reference Book, Publisher, Edition, Page No.  |
|--|--|---|
| <b>Module 1</b>                          | Job Evaluation / Grade Structure - a. Purpose and Methods of Job Evaluation, Ranking Systems, Job Classification / Grading method, Points System, Factor Comparison Method, Packaged Point Plans, Implementation, Job evaluation approach to compensation management   | Human Resource Management – Text and Cases- Dr.S S Khanka, S.Chand Publication, Ch.14<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House, Ch 14<br><br>Compensation Management – Dipak Kumar Bhattacharya, Oxford University press, Ch 4  |
| <b>Module 2</b>                          | Compensation Planning – Concept of Minimum Wage ,Fair wage, Living Wage , Nature and objectives of Compensation, Wages, Wage Fixation, wage fixation institutions in India, Wage differentials, Wage Plans – Rowan /Halsey; Components of Compensation –Base compensation – Perks, Fringe Benefits, Pay for Performance – Incentives; Bonuses- concept & methods of calculation  | Human Resource Management – Text and Cases- K Ashwatthapa, 6 <sup>th</sup> Edition; Tata Mac Graw Hill Publication, Ch 11,12,13,15<br><br>Human Resource Management – Text and Cases- Dr.S S Khanka, S.Chand Publication, Ch.15<br><br>Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House, Ch 16 |
| <b>Module 3</b>                          | Strategic Perspective of Compensation – Aligning compensation strategy with Business strategy, Competency Based Compensation program, Managing Compensation; Compensation as a retention strategy.   | Compensation Management-Dr.Kanchan Bhatia, Himalaya Publishing House, Ch.2,3  |
| <b>Module 4</b>                          | Incentive Plans and Fringe Benefits- Characteristics, benefits and types of Incentive Plans, Profit/Gain Sharing – Concept and issues; Fringe benefits – Concept, need & objectives of fringe benefits, Fringe benefits in India.  | Compensation Management-Dr.Kanchan Bhatia, Himalaya Publishing House, Ch.6  |
| <b>Module 5</b>                          | Statutory Provisions related to Compensation - Payment of Wages Act 1936, Minimum Wages Act 1948, Payment of Bonus Act 1965, Employees State Insurance Act 1948, Employees Provident Fund Act 1952, Payment of Gratuity Act 1972   | Compensation Management-Dr.Kanchan Bhatia, Himalaya Publishing House, Ch.10   |
| <b>Other Reference books and sources</b> | 1. Essentials of Human Resource Management & Industrial Relations – P Subbarao, 3 <sup>rd</sup> Revised Edition; Himalaya Publishing House<br><br>2. Performance Appraisal and Compensation Management: A Modern Approach, 2nd Edition, Dewakar Goel, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120345652<br><br>3. Compensation Management, 2nd Edition, Dipak Kumar Bhattacharya, Oxford University Press, ISBN-13: 978-0199456543<br><br>4. Compensation: Special Indian Edition George Milkovich, Jerry Newman & C S Venkatratnam, 9th Edition, McGraw Hill Education, ISBN-13: 978-0070151581 |   |

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|-----------------------------------|--|------------------|-----|----------------|---|--|--|--|--|
| Semester                          | III  | Course Code      | 3T1 | Type of Course | Elective  |  |  |  |  |
| Course Name                       | OM1: LOGISTICS AND SUPPLY CHAIN MANAGEMENT   |                  |     |                |   |  |  |  |  |
| Credits                           | 4  | Number of hours: |     | 40             |   |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |                |   |  |  |  |  |
| CO1                               | At the end of the course the student will be able to <b>analyze</b> the business requirement and apply supply chain strategies   |                  |     |                |   |  |  |  |  |
| CO2                               | The student will be able to <b>design</b> effective distribution network for a company.  |                  |     |                |   |  |  |  |  |
| CO3                               | The student shall be able to reduce transportation costs by <b>applying</b> optimization techniques.   |                  |     |                |   |  |  |  |  |
| CO4                               | The student shall be able to <b>map</b> the supply chain requirement as per the resources available by identifying the non value added services within the supply chain.                       |                  |     |                |   |  |  |  |  |
| CO5                               | The student will be able to <b>measure</b> the performance of the supply by applying various metrics in different areas  |                  |     |                |   |  |  |  |  |
| <b>Detailed Contents</b>          |  |                  |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |  |
| Module 1                          | <b>Supply Chain Management:</b> Concept, Decision Phases in Supply chain, Supply chain strategies, Drivers of supply chain performance, competitive advantage through supply chain management. |                  |     |                |   |  |  |  |  |
|                                   |  |                  |     |                |   |  |  |  |  |
|                                   |  |                  |     |                |   |  |  |  |  |
| Module 2                          | <b>Supply Chain Network:</b> Factors influencing distribution network design, Design options for   |                  |     |                |   |  |  |  |  |

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|                                   | distribution network, Designing distribution network in various business applications, E-supply chain, and impact of uncertainty on network design.  | By Janat Shah, Pearson Publication, Chapter 6  |
| Module 3                          | <b>Network Optimization:</b> Optimization approach and techniques, Role of transportation in supply chain, factor influencing transport decisions, modes of transportation and selection process Warehousing Management, Reverse Logistics | Supply Chain Management, A Managerial Approach, By Amit Sinha & Herbert Kotzab, McGrawHill Publication , Chapter 9 and 12  |
| Module 4                          | <b>Procurement and Suppliers Relationship:</b> Procurement overview, Purchase process and purchasing cycle, Supplier Relationship Management, Supplier segmentation and Supplier evaluation  | Supply Chain Management, A Managerial Approach, By Amit Sinha & Herbert Kotzab, McGrawHill Publication, Chapter 13   |
| Module 5                          | <b>SCM Performance Measures:</b> Importance of performance measure, Introduction to SCOR Model, Types of Performance Measures – Productivity Measure, Quality Measure, Customer Service Measure and Cost Measure                           | Supply Chain Management, Concepts and Cases, By Rahul Altekar, Eastern Economy Edition, Chapter 7  |
| Other Reference books and sources |  | <ol style="list-style-type: none"> <li>1. Operations and Supply Chain Management, 8ed, ISV, Russel &amp; Taylor, 8<sup>th</sup> Edition, Wiley, ISBN-13: 978-8126556823</li> <li>2. Supply Chain Management, 6<sup>th</sup> Edition, Sunil Chopra, Peter Meindl &amp; D. V. Kalra, Pearson Education India, ISBN-13: 978-9332548237</li> <li>3. Supply Chain Management: Strategy, Planning, and Operation, Global Edition, 7<sup>th</sup> Edition, Sunil Chopra, Pearson Education India, ISBN-13: 978- 1292257891</li> <li>4. Logistics Management, Satish C Ailawadi &amp; Rakesh P Singh, 2d Edition, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120345041</li> </ol> |

| Semester                          | III                                      | Course Code      | 3T2 | Type of Course | Elective |
|-----------------------------------|--|------------------|-----|----------------|----------|
| Course Name                       | <b>OM2: QUALITY TOOLKIT FOR MANAGERS</b> |                  |     |                |          |
| Credits                           | 4  | Number of hours: |     | 40             |          |
| <b>Detailed Course Objectives</b> |  |                  |     |                |          |

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| CO1 | The student will be able to <b>analyze</b> the dimensions of Quality and apply quality systems for effective quality improvement. |
| CO2 | The student will be able to <b>select</b> appropriate statistical tools for quality analysis.                                     |
| CO3 | The student will be able to <b>recommend</b> appropriate SPC tools to improve process quality.                                    |
| CO4 | The student will be able to <b>set bench marks</b> for the organization and apply TQM tools for quality improvement.              |
| CO5 | The student will be able to <b>apply</b> productivity tools for improving efficiency in the plant.                                |

| Detailed Contents |   | Reference Book, Publisher, Edition, Page No.  |
|-------------------|---|---|
| <b>Module 1</b>   | <b>Introduction to Quality Concepts:</b> Dimensions of Quality, Cost of Quality, Quality philosophies, Quality systems, contribution of Quality gurus.  | Total Quality Management, Text and Cases, By K. Shridhara Bhat, Himalaya Publishing House, Chapter 1 and 3<br><br>Quality Management, By Kanishka Bedi, Oxford<br><br>Chapter 7   |
| <b>Module 2</b>   | <b>Quality Assurance and Control -</b> Concepts of Quality Assurance, Objectives, Quality Manual, Specification and Design Control, Process control, inspection and testing, Quality assurance in Services  | Quality Management, By Kanishka Bedi, Oxford, Chapter 13  |
| <b>Module 3</b>   | <b>Statistical Process Control (SPC):</b> 7 tools of quality, control charts for variable and attributes, control chart techniques, X bar, R bar correlation. Pareto diagrams, cause and effect diagrams scatter diagrams, run charts, histograms, and flow charts. | Production and Operations Management, By K. Aswathappa and K. Shridhara Bhat, Himalaya Publishing House, Chapter 17<br><br>Operations management, Theory and Practice, By. B. Mahadevan, Pearson Publication, Chapter 8 |
| <b>Module 4</b>   | <b>TQM tools:</b> TQM Frame work, Benchmarking, benchmarking process, QFD (Quality function Deployment), TPM (Total Productive Maintenance) and FMEA (Failure Mode and Effects Analysis).   | Total Quality Management, Text and Cases, By K. Shridhara Bhat, Himalaya Publishing House<br><br>Quality Management, By Kanishka Bedi,  |

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|  |   | Oxford<br>Chapter 2   |
| <b>Module 5</b>                          | <b>Quality Improvement Techniques:</b> KAIZEN, Six Sigma, ISO, 5S, QC, Poka-Yoke, Lean Manufacturing, Service Quality   | Production and Operations Management, By R.Paneerselvam, third edition, Eastern Economy Edition, Chapter 20<br><br>Operations Management, By B Mahadevan, Pearson Publication, Chapter 5,Page 171 |
| <b>Other Reference books and sources</b> | 1. Total Quality Management, 3 <sup>rd</sup> Editio, Poornima M. Charantimath, Pearson Education, ISBN-13: 978-9332579392<br>2. Total Quality Management (TQM) 5 <sup>th</sup> edition, Basterfeild & Urdhwareshe, Pearson Education, ISBN-13: 978-9353066314<br>3. Quality Management, R. Panneerselvam & P. Sivasankaran, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120349438<br>4. Total Quality Management, V. Vijayan & H. Ramakrishna, S. Chand Publishing, ISBN-13: 978-9384319557 |   |
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| Semester                          | III   | Course Code      | 3T3 | Type of Course | Elective |  |  |  |  |
|-----------------------------------|---|------------------|-----|----------------|----------|--|--|--|--|
| Course Name                       | <b>OM3: OPERATIONS RESEARCH</b>   |                  |     |                |          |  |  |  |  |
| Credits                           | 4   | Number of hours: |     | 40             |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                  |     |                |          |  |  |  |  |
| CO1                               | The students will be able to <b>attempt</b> operation related problems by <b>suggesting</b> various operation research tools. |                  |     |                |          |  |  |  |  |
| CO2                               | The students will be able to <b>analyze</b> LPP and Game Problems and find solutions for business decisions.                  |                  |     |                |          |  |  |  |  |
| CO3                               | The students will be able to <b>analyze</b> and evaluate assignment problems to find solutions.                               |                  |     |                |          |  |  |  |  |
| CO4                               | The students will be able to <b>analyze</b> and evaluate Transportation problems to optimize costs.                           |                  |     |                |          |  |  |  |  |

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| CO5                                      | The students will be able to <b>apply</b> PERT/ CPM tools for optimizing time and cost in project management.   |   |
|  | <b>Detailed Contents:</b>   |   |
| <b>Module 1</b>                          | <b>Introduction to Operation Research:</b> Concept of Operation research, Main phases of operation research, Problem solving and decision making. Application of Operation research in Business.  | J K Sharma, Operations Research Problems Solution, McMillan Publication, Chapter 1<br><br>Operation Research By S. Kalavathy, Fourth Edition, VIKAS Publications, Chapter 1   |
| <b>Module 2</b>                          | <b>Linear Programming &amp; Game Theory:</b> Formulation of Linear Programming problems, graphical method for solution of LPP, Game models, 2 persons, zero sum games and their solutions. Solution of $2 \times n$ and $m \times 2$ games by graphical methods.  | J K Sharma, Operations Research Problems Solution, McMillan Publication, Chapter 3 and Chapter 16   |
| <b>Module 3</b>                          | <b>Assignment:</b> Assumptions and formulation of Assignment problems, Hungarian method, Maximization problems.   | J K Sharma, Operations Research Problems Solution, McMillan Publication, Chapter 14   |
| <b>Module 4</b>                          | <b>Transportation:</b> Steps involved in transportation problems, Initial feasible solutions – NWCR, LCM, VAM, Testing degeneracy, testing optimality, MODI method.   | J K Sharma, Operations Research Problems Solution, McMillan Publication, Chapter 13<br><br>Operation Research By S. Kalavathy, Fourth Edition, VIKAS Publications, Chapter 8  |
| <b>Module 5</b>                          | <b>PERT / CPM:</b> Network rules and network diagrams, calculation of Earliest Start and Finish Times, Latest Start and Finish Times, identification of critical path, and project duration.  | J K Sharma, Operations Research Problems Solution, McMillan Publication, Chapter 17<br><br>Operation Research By S. Kalavathy, Fourth Edition, VIKAS Publications, Chapter 15 |
| <b>Other Reference books and sources</b> | 1. Operations Research, 7 <sup>th</sup> Edition, PK Gupta & DS Hira, S Chand ISBN-13: 978-8121902816<br>2. Operations Research – Introduction to Management Science, Kanti Swaroop, PK Gupta, Man Mohan, Sultan Chand and Sons, ISBN-13: 978-9351611011<br>3. Operations Research: An Introduction, 9e Hamdy A Taha, Pearson Education India, ISBN-13: 978-9332518223<br>4. Operations Research: Principles and Applications, 3 <sup>rd</sup> Edition, G. Srinivasan, PHI Learning Private Limited, ISBN-13: 978-8120353107 |   |

| Semester                          | III  | Course Code      | 3T1 | Type of Course                                      | Elective  |  |  |  |
|-----------------------------------|--|------------------|-----|---|---|--|--|--|
| Course Name                       | <b>BA1: DATA VISUALIZATION FOR MANAGERS</b>  |                  |     |   |   |  |  |  |
| Credits                           | 4  | Number of hours: | 40  |   |   |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |   |   |  |  |  |
| CO1                               | The student will be able to <b>identify</b> and <b>use</b> Interactive data visualization software desktop tools and will also be able to <b>create</b> Interactive data visualization software desktop workspace  |                  |     |   |   |  |  |  |
| CO2                               | The student will be able to <b>connect</b> data and will also be able to <b>use</b> Interactive data visualization software's File Types effectively.  |                  |     |   |   |  |  |  |
| CO3                               | The student will be able to create analytics pane and will also be able to use Sort, Filters, Sets, Groups and Hierarchy functions   |                  |     |   |   |  |  |  |
| CO4                               | The student will be able to <b>create</b> calculations to enhance the data visualisation   |                  |     |   |   |  |  |  |
| CO5                               | The student will be able to <b>build</b> effective dashboard   |                  |     |   |   |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |     | <b>Reference Book, Publisher, Edition, Page No.</b> |   |  |  |  |
| Module 1                          | <b>Creating Visual Analytics with Interactive data visualization software Desktop</b> - Shortcomings of Traditional Information Analysis, Business Case for visual analysis, The Interactive data visualization software Software Ecosystem, Introducing Interactive data visualization software Desktop Workspace |                  |     |   | Tableau your Data, Daniel G Murray, 2 <sup>nd</sup> Edition, Wiley Publishing, ISBN-13: 978-8126573448, Chapter 1 |  |  |  |
| Module 2                          | <b>Connecting Data</b> - How to connect Data, What are generated values, Use of Data Connection and Data Extract, Joining Database Table with Tableau, Blending different Datasources in single Worksheet, Data Quality Problem  |                  |     |   | Tableau your Data, Daniel G Murray, 2 <sup>nd</sup> Edition, Wiley Publishing, ISBN-13: 978-8126573448, Chapter 2 |  |  |  |
| Module 3                          | <b>Building Visualisation</b> - Fast and Easy Analysis via "Show me", how "Show Me" works, Trendlines and Reference Lines, Sorting Data in Interactive data visualization software,  |                  |     |   | Tableau your Data, Daniel G Murray, 2 <sup>nd</sup> Edition, Wiley Publishing, ISBN-13: 978-8126573448, Chapter 3 |  |  |  |

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|-----------------------------------|---|---|
|                                   | Enhancing views with Filters, Sets, Groups and Hierarchies  |   |
| Module 4                          | <b>Creating Calculations to Enhance Data-</b> Aggregation, Calculated Values and Table Calculations, Using Calculation Dialogue box, Binding Formulas using Table Calculations, Table Calculation Functions, Flexibility to Calculation Parameters, Function Reference appendix   | Tableau your Data, Daniel G Murray, 2 <sup>nd</sup> Edition, Wiley Publishing, ISBN-13: 978-8126573448, Chapter 4 |
| Module 5                          | <b>Bringing together with Dashboard -</b> Dashboard as facilitator, Interactive data visualization software for improving Dashboard, Right and Wrong Ways to build a Dashboards, Best practices to build Dashboard, Building advanced Dashboard, Sharing Dashboard with Interactive data visualization software Reader and Server, Designing Mobile Consumption, Interactive data visualization software and Load Speed   | Tableau your Data, Daniel G Murray, 2 <sup>nd</sup> Edition, Wiley Publishing, ISBN-13: 978-8126573448, Chapter 8 |
| Other Reference books and sources | 1. Tableau 10 Complete Reference: Transform your business with rich data visualizations and interactive dashboards with Tableau 10, Joshua MilliganPackt Publishing Limited, ISBN-13: 978-1789957082<br>2. Visual Analytics with Tableau, Alexander Loth, John Wiley & Sons, ISBN-13: 978-1119560203<br>3. Tableau Cookbook - Recipes for Data Visualization, Shweta Sankhe-Savale, Packt Publishing Limited, ISBN-13: 978-1784395513<br>4. Tableau: Creating Interactive Data Visualizations, Jen Stirrup,Ashutosh Nandeshwar, Ashley Ohmann, Matt Floyd, Packt Publishing Limited, ISBN-13: 978- 1787124196 |   |

| Semester                          | III  | Course Code      | 3T2 | Type of Course | Elective |  |  |  |  |
|-----------------------------------|--|------------------|-----|----------------|----------|--|--|--|--|
| Course Name                       | <b>BA2: DATA MINING</b>  |                  |     |                |          |  |  |  |  |
| Credits                           | 4  | Number of hours: |     | 40             |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |                |          |  |  |  |  |
| CO1                               | Given overview of Data Mining and Data pre-processing, the future manager will be able to <b>outline</b> major research challenges of data mining, Kinds of data and applications, Data Cleaning; Data Integration; Data Reduction; Data Transformation and Data Discretization. |                  |     |                |          |  |  |  |  |

| CO2                | Given the overview of Data Warehousing, the future manager will be able to <b>classify</b> the Concept of Data Warehousing using Data Cube and OLAP and also able to identify the process of Data Generalisation   |   |
|--------------------|--|---|
| CO3                | Given the details pertaining to Pattern Mining, the future manager will be able to <b>evaluate</b> Patterns using colossal patterns, mining compressed or approximate patterns; explore patterns and its applications.   |   |
| CO4                | Given the details pertaining to Pattern Mining, the future manager will be able to <b>analyse</b> clusters using partitioning method, hierarchical method, density based method and grid based method  |   |
| CO5                | Given the details pertaining to Pattern Mining, the future manager will be able to <b>correlate</b> the use of data mining to the society and also will be able to explain the trend in data mining.   |   |
| Detailed Contents: |  |   |
| <b>Module 1</b>    | Data Mining Concept – Introduction, Data Mining Roots, Data Mining Process, Large Data Sets, Data Warehouse for Data Mining, Business Aspect of Data mining, Preparing Data – Representation, Characteristics and Transformation of Raw Data, Missing data, Time Dependent Data, outlier analysis  | Data Mining: Concepts Models, Methods and Algorithms, Mehmed Kantardzic, 2 <sup>nd</sup> Edition, Wiley IEEE, Chapter 1 & 2 |
| <b>Module 2</b>    | Data Reduction – Dimensions of large data sets, feature reduction, relief algorithm, entropy measures for ranking features, PCA, Value Reduction, Feature Discretisation – Chi Merge Technique, case reduction Learning from Data- Learning Machine, SLT, Types of Learning methods, Common Learning Tasks, SVM, kNN-Nearest Neighbour Classifier, Model Selection vs Generalisation, Model Estimation, 90% Accuracy: Why not? | Data Mining: Concepts Models, Methods and Algorithms, Mehmed Kantardzic, 2 <sup>nd</sup> Edition, Wiley IEEE, Chapter 3&4   |
| <b>Module 3</b>    | Decision Trees and Decision Rules- Decision Trees, C4.5 algorithm-DT, Unknown Attribute Values, Pruning Decision Trees, C4.5-DR, CART algorithm and Gini Index, Limitations of decision tree and decision rules, Artificial Neural Networks – Models of Artificial Neurons, Architecture of ANNs, Learning process, Learning Tasks using ANN, Multilayer Perceptrons(MLPs), Competitive Network and Competitive Learning, SOMs | Data Mining: Concepts Models, Methods and Algorithms, Mehmed Kantardzic, 2 <sup>nd</sup> Edition, Wiley IEEE, Chapter 6&7   |
| <b>Module 4</b>    | Association Rules- Market Basket Analysis, Algorithm Apriori, From frequent itemsets to association rules, Improving efficiency of Apriori Algorithm, EP growth model, Associative Classification Method, Multidimensional Association- Rules Mining   | Data Mining: Concepts Models, Methods and Algorithms, Mehmed Kantardzic, 2 <sup>nd</sup> Edition, Wiley IEEE, Chapter 10    |
| <b>Module 5</b>    | Web Mining and Text Mining- Web Mining, Web Content, structure and usage mining, HITS and LOGSOM algorithm, Mining Path Traversal Patterns, Page Rank Algorithm, Text Mining, LSA,   | Data Mining: Concepts Models, Methods and Algorithms, Mehmed Kantardzic, 2 <sup>nd</sup> Edition, Wiley IEEE, Chapter 11    |

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| <b>Other Reference books and sources</b>  | <p>1. Data Mining Practical Machine Learning Tools and Techniques, 2nd Edition, Elsevier Publication.</p> <p>2. Introduction to Data Mining (Second Edition), Pearson Publication</p> <p>3. Data Mining: The Textbook, Springer Publication</p> <p>4. Mining of Massive Data, Second Edition, Cambridge University Press</p> <p>5. <a href="https://towardsdatascience.com">https://towardsdatascience.com</a></p> |
| <b>*Open Source BA tools like OrientDB, MongoDB, NoSQL, Trifecta Rapidminer etc should be used to elaborate the contents above.</b> |  |

| Semester                          | III   | Course Code      | 3T3 | Type of Course                                      | Elective   |  |  |  |
|-----------------------------------|---|------------------|-----|---|--|--|--|--|
| Course Name                       | <b>BA3: DATA SCIENCE USING R</b>  |                  |     |   |  |  |  |  |
| Credits                           | 4   | Number of hours: | 40  |   |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                  |     |   |  |  |  |  |
| <b>CO1</b>                        | Given overview of types of Data, the future manager will be able to <b>read</b> data from different files and create matrices and data frames using R                               |                  |     |   |  |  |  |  |
| <b>CO2</b>                        | Given the overview of functions, subset and loop; the future manager will be able to <b>explain</b> the character functions, date function, package, control statement and do loop. |                  |     |   |  |  |  |  |
| <b>CO3</b>                        | Given the basic statistical data, the future manager will be able to <b>draw</b> charts, histogram and plots, and measure central tendencies.                                       |                  |     |   |  |  |  |  |
| <b>CO4</b>                        | Given the data for testing of hypothesis, the future manager will be able to <b>test</b> the hypothesis by applying t-test, ANOVA and Chi-square test                               |                  |     |   |  |  |  |  |
| <b>CO5</b>                        | Given the data of variables, the future manager will be able to <b>apply</b> Linear Regression, Logistic regression, Cluster Analysis, Time Series, Decision Tree and Random Forest |                  |     |   |  |  |  |  |
| <b>Detailed Contents:</b>         |   |                  |     | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |  |
| <b>Module 1</b>                   | Basic fundamentals, installation and use of software, data editing, use of R as a calculator, functions and assignments, Use of R as a calculator, functions and matrix operations, |                  |     |   | Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in |  |  |  |

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|                 | missing data and logical operators.  | R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016 Appendix A<br><a href="https://swayam.gov.in/nd1_noc19_ma33/preview">https://swayam.gov.in/nd1_noc19_ma33/preview</a>  |
| <b>Module 2</b> | Conditional executions and loops, data management with sequences, Data management with repeats, sorting, ordering, and lists   | Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016 Appendix A<br><a href="https://swayam.gov.in/nd1_noc19_ma33/preview">https://swayam.gov.in/nd1_noc19_ma33/preview</a> |
| <b>Module 3</b> | Data management with repeats, sorting, ordering, and lists, Vector indexing, factors, Data management with strings, display and formatting   | Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016 Appendix A<br><a href="https://swayam.gov.in/nd1_noc19_ma33/preview">https://swayam.gov.in/nd1_noc19_ma33/preview</a> |
| <b>Module 4</b> | Data management with display paste, split, find and replacement, manipulations with alphabets, evaluation of strings, data frames, Data frames, import of external data in various file formats, statistical functions, compilation of data. | Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016 Appendix A<br><a href="https://swayam.gov.in/nd1_noc19_ma33/preview">https://swayam.gov.in/nd1_noc19_ma33/preview</a> |
| <b>Module 5</b> | Graphics and plots, statistical functions for central tendency, variation, skewness and kurtosis, handling of bivariate data through graphics, correlations, programming and illustration with examples,                                     | Introduction to Statistics and Data Analysis - With Exercises, Solutions and Applications in R By Christian Heumann, Michael Schomaker and Shalabh, Springer, 2016 Appendix A<br><a href="https://swayam.gov.in/nd1_noc19_ma33/preview">https://swayam.gov.in/nd1_noc19_ma33/preview</a> |

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|  |  | <a href="#">View</a> |
| <b>Other Reference books and sources</b> | <p>1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services (2015)</p> <p>2. Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner by Shmueli, G., Patel, N. R., &amp; Bruce, P. C. (2010)</p> <p>3. Data Analytics Using R, Seema Acharya, McGraw Hill Education, ISBN-13: 978-9352605248</p> <p>4. R for Everyone: Advanced Analytics and Graphics, 2nd Edition, Jared P. Lander, Pearson Education, ISBN-13: 978-9386873521</p> |                      |

| Semester           | III  | Course Code             | 3T1 | Type of Course | Elective |
|--------------------|--|-------------------------|-----|----------------|----------|
| <b>Course Name</b> | <b>ED1: ENTREPRENEURIAL THEORY AND PRACTICES</b> |                         |     |                |          |
| <b>Credits</b>     | 4  | <b>Number of hours:</b> |     | <b>40</b>      |          |

#### Detailed Course Objectives

|            |   |
|------------|---|
| <b>CO1</b> | On completion of module, the student will be able to <b>understand</b> the concept of entrepreneurship and what entrepreneurs do. They will also be able to relate the work of few prominent Indian entrepreneurs with the learned concept and <b>compare</b> the work of a manager with that of an entrepreneur. |
| <b>CO2</b> | On completing this module, the student will learn how entrepreneurship evolved from its earlier disorganized form to the current Government supported form. They will also be able to <b>justify</b> the role of EDPs in growth of entrepreneurship.  |
| <b>CO3</b> | Upon studying this module, the students will be able to <b>explain</b> the theories of entrepreneurship and also how the entrepreneurial knowledge gained can be <b>applied</b> to developing entrepreneurial ventures in different economic sectors in India.  |
| <b>CO4</b> | On properly studying this module, the student will be able to <b>examine</b> the impact of different financial aspects on entrepreneurship and can <b>evaluate</b> his/her own ability to set up a small scale venture.   |
| <b>CO5</b> | On studying this module, the student will be able to <b>create</b> a mental map of the network of Government support system and various institutions purposely designed and set up, at national, state and district level, for assisting entrepreneurial ventures.  |

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| <b>Detailed Contents:</b> | <b>Reference Book, Publisher, Edition, Page No.</b> |
|---------------------------|---|

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| <b>Module 1</b>                          | Evolution of the concept of entrepreneurship. The entrepreneur: characteristics and functions, types of entrepreneurs, distinction between manager and an entrepreneur. Intrapreneur: concept, characteristics, barriers, intrapreneurial climate and culture. Factors contributing to entrepreneurship development. Theories of entrepreneurship. Indian entrepreneurs and their ventures (cases). | 1. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016.<br>2. Entrepreneur Development, Satish Taneja, Himalaya Publishing House, 2010, pages 64-75.<br>3. Dynamics of entrepreneurial development and management, Vasant Desai, Himalaya Publishing House, pages 54-66. |
| <b>Module 2</b>                          | Post-independence growth of entrepreneurship in India, role of entrepreneurship in economic development. Entrepreneurship development programmes: objectives, phases, evaluation and problems of EDPs. Entrepreneurial competencies: meaning, major competencies and developing competencies.   | 1. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016, pages 36-50, 214-246.  |
| <b>Module 3</b>                          | Theory of achievement motivation, Prof. David McClelland's contribution, Kakinada experiment. Women entrepreneurship in India, problems of women entrepreneurship. Rural entrepreneurship in India and its importance, problems of rural entrepreneurship. Entrepreneurship in various sectors: tourism, agriculture and social. Micro and small scale enterprises.                                 | 1. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016, pages 36-132.<br>2. Small scale industries & entrepreneurship, Vasant Desai, Himalaya Publishing House, pages 3-55.  |
| <b>Module 4</b>                          | Steps for starting a small scale industry, ownership pattern. Financial analysis: Ratio analysis, investment process, break-even analysis, profitability analysis, budget and planning process. Sources of finance: development finance, project financing.   | 1. Dynamics of entrepreneurial development and management, Vasant Desai, Himalaya Publishing House, Page 626-644, 303-395 and 423-504.<br>2. Small scale industries & entrepreneurship, Vasant Desai, Himalaya Publishing House, pages 101-117.                                     |
| <b>Module 5</b>                          | Entrepreneurial support systems: Institutional finance to entrepreneurs (various institutions), institutional support to entrepreneurs (various institutions), lease and hire purchase, benefits in taxation to entrepreneurs, Government policy and support to SSI. Sickness in small scale industries.  | 1. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016, Page 379-441.<br>2. Dynamics of entrepreneurial development and management, Vasant Desai, Himalaya Publishing House, Page 707-721.   |
| <b>Other Reference books and sources</b> | 1. Entrepreneurship: A South-Asian Perspective, Kuratko, T.V. Rao, Cengage Learning, 2012.<br>2. Entrepreneur Development, Satish Taneja, Himalaya Publishing House, 2012.<br>3. Essentials of Entrepreneurship and Small Business Management, Scarborough & Cornwall, Pearson, 2016.<br>4. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016  |   |

| Semester | III | Course Code | 3T2 | Type of Course | Elective |
|----------|-----|-------------|-----|----------------|----------|
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|-----------------------------------|---|-------------------------|---|
| <b>Course Name</b>                | <b>ED2: BUSINESS PLAN FORMULATION</b>   |                         |   |
| <b>Credits</b>                    | <b>4</b>  | <b>Number of hours:</b> | <b>40</b>   |
| <b>Detailed Course Objectives</b> |   |                         |   |
| <b>CO1</b>                        | On completion of module, the student will be able to <b>understand</b> the concept and importance of a business plan in entrepreneurship. They will also be able to <b>explain</b> the elements of a good business plan, in order to be effective.                |                         |   |
| <b>CO2</b>                        | On studying this module, the students will be able to <b>classify</b> projects into categories and will also be able to <b>formulate</b> a basic business plan (project).   |                         |   |
| <b>CO3</b>                        | Upon going through this module, students will be in a position to understand how to <b>develop</b> ideas for a business project. They will also be able to <b>assess</b> the role of environment on different economic sectors and opportunities in India.        |                         |   |
| <b>CO4</b>                        | On properly studying this module, the student will be able to <b>examine</b> the importance of project appraisal and can <b>evaluate</b> the different parameters that contribute to feasibility of a business project.   |                         |   |
| <b>CO5</b>                        | Detailed study of this module will enable students to <b>formulate</b> steps in starting a small enterprise and visualise a model of small business. They will be able to <b>relate</b> the project to various permissions required for entrepreneurial ventures. |                         |   |
| <b>Detailed Contents:</b>         |   |                         | <b>Reference Book, Publisher, Edition, Page No.</b> |
| <b>Module 1</b>                   | Business plan: meaning and significance of a business plan, major contents, formulation of a business Plan, common mistakes in business plan.   |                         |   |
| <b>Module 2</b>                   | Project: classification, project cycle, phases. Project identification. Project formulation.  |                         |   |
| <b>Module 3</b>                   | Project ideas: entrepreneurial environment scanning, identification of opportunities,   |                         |   |

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|  | selecting a product, network analysis, project report.   | Vasant Desai, Himalaya Publishing House, pages 374-405.<br>2. Small scale industries & entrepreneurship, Vasant Desai, Himalaya Publishing House, pages 254-274   |
| <b>Module 4</b>                          | Project appraisal: meaning and concept, methods of project appraisal, project feasibility analysis, sample feasibility report.   | 1. Entrepreneur Development, Satish Taneja, Himalaya Publishing House, 2010, pages 93-102.<br>2. Entrepreneurial Development, S.S. Khanka, S. Chand & Co., 2016, pages 321-333.   |
| <b>Module 5</b>                          | Steps in starting a small enterprise, whom to approach for what, sample project profile.. Osterwalder's business model canvas.   | 1. Small scale industries & entrepreneurship, Vasant Desai, Himalaya Publishing House, pages 407-420.<br>2. Essentials of Entrepreneurship and Small Business Management, Scarborough & Cornwall, Pearson, 2016, pages 150-157. |
| <b>Other Reference books and sources</b> | 1. Entrepreneurship Development and Small Business Enterprises, 2e, Poornima M Charantimath, Pearson Education India, ISBN-13: 978-8131762264<br>2. Project Management, Vasant Desai Himalaya Publications, ISBN-13: 978-9351420378<br>3. Entrepreneur 5 P.M. to 9 A.M.: Launching a Profitable Start-Up, Kanth Miriyala, Reethika Sunder, Rupa Publications India; First editionISBN-13: 978-8129123930<br>4. |   |

| Semester    | III                                 | Course Code | 3T3 | Type of Course | Elective |
|-------------|-------------------------------------|-------------|-----|----------------|----------|
| Course Name | <b>ED3: SOCIAL ENTREPRENEURSHIP</b> |             |     |                |          |

| Credits                                   | 4   | Number of hours: | 40   |
|---|---|------------------|--|
| <b>Detailed Course Objectives</b>         |   |                  |  |
| CO1                                       | Under given circumstances the Learner shall <b>identify</b> the motivating factors and success factors of a Social enterprise.  |                  |  |
| CO2                                       | In context of the Indian Society, the learner shall <b>enlist</b> the socio economic challenges and <b>identify</b> the Opportunities for creation of a Social Enterprise   |                  |  |
| CO3                                       | Under exemplified conditions the Learner shall be able to <b>discover</b> the business models of Social Entrepreneurship.   |                  |  |
| CO4                                       | Under different circumstances the learner will be able to <b>select</b> an appropriate form of Social enterprise.   |                  |  |
| CO5                                       | Given the case the learner shall be able to <b>interpret</b> the business model and <b>illustrate</b> the reasons for success of a social enterprise.   |                  |  |
| Detailed Contents:                        |   |                  | Reference Book, Publisher, Edition, Page No. |
| Module 1                                  | Concept of Social Enterprise, Purpose, Motivation, Characteristics of Social Entrepreneurs, Success Factors of Social Enterprise  |                  |  |
| Module 2                                  | Social Entrepreneurship: Socio-Economic Issues ad challenges in Indian Context, Concept of Sustainability, Sustainable Development Goals , Opportunity Recognition in Social Enterprise                               |                  |  |
| Module 3                                  | Social Entrepreneurship Business Models: Profit-Purpose Tension (PPT), Profit-Purpose Alignment (PPA) and Philanthropic; Business Model Innovation  |                  |  |
| Module 4                                  | Forms of Social Enterprise: Profit and non-profit Proprietorships, Partnership , company ,Non-Governmental organisation - Society - Trust and Company (sec. 25) registration, Selection of forms of Social Enterprise |                  |  |
| Module 5                                  | Case Studies in Social Entrepreneurship:  |                  |  |
| Case Studies on Social Entrepreneurship - |   |                  |  |

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|  | <p>1. Micro Finance: A Case of Grameen Bank, Bangladesh;</p> <p>2. Population Services International, the US-based NGO's War on AIDS: Making the Marketing Mix, the Myanmar Way;</p> <p>3. Aravind Eye Hospitals: A Case in Social Entrepreneurship</p>  | Vol. I, ICFAI Books ,Edited by Girija P ICFAI Business School Case Development Centre,ISBN : 978-81-314-1912-0 |
| <b>Other Reference books and sources</b> | <p>1. The Social Entrepreneur's Playbook, Expanded Edition: Pressure Test, Plan, Launch and Scale Your Social Enterprise, Ian C. MacMillan, James D. Thompson, Wharton Digital Press, ISBN-13: 978-1613630327</p> <p>2. Strategic Tools for Social Entrepreneurs: Enhancing the Performance of Your Enterprising Nonprofit, J. Gregory Dees, Jed Emerson, and Peter Economy, John Wiley &amp; Sons, 2<sup>nd</sup> Edition, ISBN-13: 978-0471150688</p> <p>3. Social Entrepreneurship: The Art of Mission-Based Venture Development, Peter C. Brinckerhoff, John Wiley &amp; Sons; ISBN-13: 978-0471362821</p> |  |

| Semester                          | III  | Course Code             | 3T1 | Type of Course                                      | Elective |  |  |  |  |
|-----------------------------------|--|-------------------------|-----|---|----------|--|--|--|--|
| <b>Course Name</b>                | <b>IB1: INTERNATIONAL MARKETING MANAGEMENT</b>   |                         |     |   |          |  |  |  |  |
| <b>Credits</b>                    | 4  | <b>Number of hours:</b> |     | <b>40</b>   |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |  |                         |     |   |          |  |  |  |  |
| <b>CO1</b>                        | At the end of the course the student shall be able to <b>differentiate</b> between domestic marketing and international marketing and <b>understand</b> clearly features of International Marketing. |                         |     |   |          |  |  |  |  |
| <b>CO2</b>                        | At the end of the course the student shall be able to <b>plan, explain and practice</b> various procedures in International marketing.   |                         |     |   |          |  |  |  |  |
| <b>CO3</b>                        | At the end of the course the student manager shall be able to <b>design</b> and <b>develop</b> Global Product Policy decisions.  |                         |     |   |          |  |  |  |  |
| <b>CO4</b>                        | At the end of the course the student manager shall be able to <b>design/develop</b> strategies for International Service Sector Marketing  |                         |     |   |          |  |  |  |  |
| <b>CO5</b>                        | At the end of the course the student manager shall be able to <b>design/develop</b> functional level strategies for Global Branding.   |                         |     |   |          |  |  |  |  |
| <b>Detailed Contents:</b>         |  |                         |     | <b>Reference Book, Publisher, Edition, Page No.</b> |          |  |  |  |  |

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| <b>Module 1</b>                          | <b>Introduction of International Marketing</b> - Definition, Features of International Marketing, Basis of International Marketing, Trends in International Marketing, Issues in transcending International Boundaries, Intellectual Property Protections.   | International Marketing (An Asia Pacific Focus) Wiley India Pvt Ltd ISBN 978-81265,-1848-7- |
| <b>Module 2</b>                          | <b>Planning for International Marketing</b> - Introduction, Global Marketing a Need of the Day, International Marketing Plan, Mode of Payment, Methods of Payment on Import, Consignment Purchase, Cash in Advance (Pre-payment), Down Payment, Open Payment, Documentary Collections, Letter of Credit  | International Marketing (An Asia Pacific Focus) Wiley India Pvt Ltd ISBN 978-81265,-1848-7- |
| <b>Module 3</b>                          | <b>International Marketing Mix</b> - Identification of Market, Consumer Index , Global Product policy Decisions, promotion, pricing, distribution strategy   | International Marketing (An Asia Pacific Focus) Wiley India Pvt Ltd ISBN 978-81265,-1848-7- |
| <b>Module 4</b>                          | <b>International Service Sector Marketing</b> - Introduction, GATS Principles, Standardization of International Services, Service Quality, Measurement of Service Quality, International Direct Marketing & Social Media Marketing   | International Marketing (An Asia Pacific Focus) Wiley India Pvt Ltd ISBN 978-81265,-1848-7- |
| <b>Module 5</b>                          | <b>Global Branding</b> - Attributes, Benefits, Values, Culture, Personality, User, Global Brand Development, Implication of Brand Equity concept, Global Branding opportunities and challenges.  | International Marketing (An Asia Pacific Focus) Wiley India Pvt Ltd ISBN 978-81265,-1848-7- |
| <b>Other Reference books and sources</b> | 1. International Marketing, 2 <sup>nd</sup> Edition, Rakesh Mohan Joshi, Oxford University Press ISBN-13: 978-0198077022<br>2. International Marketing, 4th Edition, R. Srinivasan, PHI Learning, ISBN-13: 978-8120352384<br>3. Global Marketing Management, 8e, Warren J Keegan, Pearson Education, ISBN-13: 978-9332584327<br>4. International Marketing Management, Subhash Jain, CBS, 3 edition, ISBN-13: 978-8123912752 |   |

| Semester    | III   | Course Code      | 3T2 | Type of Course | Elective |
|-------------|---|------------------|-----|----------------|----------|
| Course Name | <b>IB2: EXPORT DOCUMENTATION AND PROCEDURES</b> |                  |     |                |          |
| Credits     | 4   | Number of hours: |     | 40             |          |

### Detailed Course Objectives

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|------------|---|
| <b>CO1</b> | Students should be able to <b>understand</b> various preliminaries for exports and IEC codes and should be able to <b>analyze</b> functions of export marketing organizations and trading houses. |
| <b>CO2</b> | Students should be able to <b>understand</b> various preliminaries of import and should be able to <b>perceive</b> concepts involved in import documentation and procedures.                      |
| <b>CO3</b> | Students should be able to <b>relate</b> the concepts with selection of products and markets for exports as well as <b>examine</b> the pricing and payment methods in exports                     |
| <b>CO4</b> | Students should be able to <b>understand</b> and <b>elaborate</b> various concepts in Export documentation, export procedures and contracts.  |
| <b>CO5</b> | Students should be able to <b>perceive</b> the procedures and intricacies of excise clearance and should be able to understand various shipment and post-shipment formalities                     |

| <b>Detailed Contents:</b> |   | <b>Reference Book, Publisher, Edition, Page No.</b>  |
|---------------------------|---|--|
| <b>Module 1</b>           | Classification of goods for exports, methods of exporting, Export Marketing organizations in India and their functions, trading houses, registration formalities, IEC code : procedure and exemptions, export license | Jain Khushpat, Export Import Procedures and documentation, Himalaya Publishing House<br>Chapter 1 & 2    |
| <b>Module 2</b>           | Preliminaries of Import, Import documentation; Transport documents, bill of entry, airway bill, certificate of inspection & measurement, freight declaration. Import procedures                                       | Jain Khushpat, Export Import Procedures and documentation, Himalaya Publishing House Chapter 5, 7 and 12 |
| <b>Module 3</b>           | Selection of Products and markets for exports : FPS, FMS, Export pricing strategies, Export price quotations, Components of export price: FOB & CFR price, Methods of export payment, Letter of credit                | Jain Khushpat, Export Import Procedures and documentation, Himalaya Publishing House Chapter 3 & 4       |
| <b>Module 4</b>           | Export Documentation: ADS, Export documentation in India and various documents. Export procedures : pre-shipment , shipment and post shipment procedures, Export contract   | Jain Khushpat, Export Import Procedures and documentation, Himalaya Publishing House Chapter 6 & 8       |
| <b>Module 5</b>           | Excise clearance and quality inspection: procedure for central excise clearance for exportable goods, pre-shipment inspection & its procedure, marine insurance, role of C&F agents, shipping and customs             | Jain Khushpat, Export Import Procedures  |

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|  | formalities and various procedures in exports shipping   | and documentation, Himalaya Publishing House Chapter 10 & 11 |
| <b>Other Reference books and sources</b> | 1. Export Import Procedures - Documentation and Logistics, C. Rama Gopal, NEW AGE; First edition, ISBN-13: 978-8122418507<br>2. IBO-4 Export Import Procedures and Documentation, Sudhir Kochhar, Gullybaba Publishing House (P) Ltd; 1 edition (2012), ISBN-13: 978-9381066560<br>3. Export Management, D.C. Kapoor, Vikas Publication.; First edition (2002), ISBN-13: 978-8125909392<br>4. Export Import Management, Parul Gupta, McGraw Hill Education; First edition, ISBN-13: 978-9387067592 |  |

| Semester                          | III  | Course Code | 3T3              | Type of Course                                      | Elective   |  |  |
|-----------------------------------|--|-------------|------------------|---|--|--|--|
| <b>Course Name</b>                | <b>IB3: INTERNATIONAL FINANCE</b>  |             |                  |   |  |  |  |
| <b>Credits</b>                    | 4  |             | Number of hours: |   | 40   |  |  |
| <b>Detailed Course Objectives</b> |  |             |                  |   |  |  |  |
| <b>CO1</b>                        | Students Should be able to <b>perceive</b> various concepts involved in International Monetary system and various concepts like international liquidity and SDR                                      |             |                  |   |  |  |  |
| <b>CO2</b>                        | Students should be able to <b>understand</b> methods of exchange rate determination , understand working of foreign exchange market and <b>relate</b> these concepts with existing scenario in India |             |                  |   |  |  |  |
| <b>CO3</b>                        | Students should be able to <b>understand and analyze</b> currency contracts and options. They should be able to <b>examine</b> risks involved in foreign trade and ways to manage the risks.         |             |                  |   |  |  |  |
| <b>CO4</b>                        | Students should be able to understand management of short term finance in Multinational corporations and international financing decisions including funding and borrowing decisions                 |             |                  |   |  |  |  |
| <b>CO5</b>                        | Students should be able to <b>understand and analyze</b> various concepts like BOP, transfer pricing , structure of International banking and standards of international accounting                  |             |                  |   |  |  |  |
| <b>Detailed Contents:</b>         |  |             |                  | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| <b>Module 1</b>                   | Challenges of International Finance, International Monetary system, International Monetary   |             |                  |   | Apte Prakash G., International Finance, Tata McGraw Hill Ch1 |  |  |

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|  | Fund (IMF), International Liquidity and Special Drawing Rights (SDR)   |  |
| <b>Module 2</b>                          | Structural Models of Exchange rate determination, Exchange rate of Indian Rupee, Structure of Foreign exchange market, currency trading, exchange rate quotations and arbitrage, forward contracts, Exchange rate regimes and foreign exchange market in India   | Apte Prakash G., International Finance, Tata McGraw Hill Ch 2 & 3                          |
| <b>Module 3</b>                          | Currency Future Contracts, Currency Options, valuation of options, Defining and managing Financial exposure and risk, risk management process, coping with operating exposure  | Apte Prakash G., International Finance, Tata McGraw Hill Ch 4, 5 & 6                       |
| <b>Module 4</b>                          | Short term Financial management in Multinational Corporation, International Financial decision, Funding and borrowing options, Sourcing equity globally  | Apte Prakash G., International Finance, Tata McGraw Hill Ch 7 & 8                          |
| <b>Module 5</b>                          | Balance of Payments, Transfer Pricing, Export financing in India, International Banking and International Accounting   | Shailaja G. , International Finance, University Press India P. Ltd Ch.9, 15, 18, 19 and 20 |
| <b>Other Reference books and sources</b> | 1. International Finance, 1/e, Rajiv Srivastava, Oxford University Press, ISBN-13: 978-0199453597<br>2. International Finance: Theory and Policy, Paul R. Krugman , Maurice Obstfeld, & Marc Melitz, 10 <sup>th</sup> Edition, Pearson Education, ISBN-13: 978-9332585775<br>3. International Financial Management, Alan C. Shapiro, Peter Moles & Jayanta Kumar Seal, Wiley (2016), ISBN-13: 978-8126558728<br>4. Foreign Exchange – Practice, Concept and Control, C. Jeevanandam, Sultan Chand and Sons Publication, ISBN – 81-8054-717-1 |  |

| Semester                          | II  | Course Code                       | 3T8 | Type of Course | Core |  |  |  |  |
|-----------------------------------|---|-----------------------------------|-----|----------------|------|--|--|--|--|
| <b>Course Name</b>                | <b>STRATEGIC MANAGEMENT</b>   |                                   |     |                |      |  |  |  |  |
| <b>Credits</b>                    | 3   | <b>Number of 1 hour lectures:</b> |     | <b>30</b>      |      |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                                   |     |                |      |  |  |  |  |
| <b>CO1</b>                        | The student will be able to <b>evaluate</b> alternative paradigms of strategy and their influence on strategic decision making. |                                   |     |                |      |  |  |  |  |

| CO2                | The student will be able to <b>analyse and develop</b> the vision and mission statement for given organisations and will also be able to <b>differentiate</b> between the external and internal components of environment while <b>performing</b> SWOT analysis.   |   |
|--------------------|--|---|
| CO3                | The student will be able to design <b>and develop</b> corporate level strategies for any organization.   |   |
| CO4                | The student will be able to <b>design/develop</b> business level strategies for any organization.  |   |
| CO5                | The student will be able to <b>evaluate</b> all levels strategies and will also be <b>design/develop</b> functional level strategies for any organization.   |   |
| Detailed Contents: |  |   |
|                    |  |   |
| <b>Module 1</b>    | <b>Introduction to Strategic Management and Business Policy</b> - Evolution of strategic management and business policy, understanding strategy, strategic decision making, schools of thought of strategy formation, introduction to strategy management  | Strategic Management and Business Policy, Azhar Kazmi, 3 <sup>rd</sup> edition, McGraw Hill Education, Chapter 1  |
| <b>Module 2</b>    | <b>Strategic Intent and Strategy Formulation</b> - Vision, Mission and Values, Organisational Values and their impact on strategy, preparation of vision and mission statement, organisational objectives, Environmental Appraisal, Concept of environment, SWOT Analysis, Environmental Sectors, Environmental Scanning   | Strategic Management - Concept and Cases, Upendra Kachru, Excel Books, Chapter 2<br>Strategic Management and Business Policy, Azhar Kazmi, 3 <sup>rd</sup> edition, McGraw Hill Education, Chapter 3                            |
| <b>Module 3</b>    | <b>Corporate Level Strategies</b> - Strategy formulation, Growth Strategy, Corporate Parenting, Portfolio and other analytical models, short term corporate strategies.  | Strategic Management - Concept and Cases, Upendra Kachru, Excel Books, Chapter 7  |
| <b>Module 4</b>    | <b>Competitive Strategy/ Business Level Strategy</b> - Porter's competitive strategies, Resource based theory, Competing for tomorrow's market.  | Strategic Management - Concept and Cases, Upendra Kachru, Excel Books, Chapter 8  |
| <b>Module 5</b>    | <b>Functional and Operational Implementation</b> - Functional Strategy, Financial Plans and Policies, Marketing Plans and Policies, Personnel Plans and Policies, Operational Plans and Policies , <b>Strategy Evaluation and Selection Techniques</b> - Evaluation of Strategy, Assessing suitability, Life Cycle Analysis, Positioning, Value Chain Analysis, Business Profile, Gap Analysis | Strategic Management – Concept and Cases, Upendra Kachru, Excel Books, Chapter 9 (page no. 340-347)<br>Strategic Management and Business Policy, Azhar Kazmi, 3 <sup>rd</sup> edition, McGraw Hill Education, Chapter 13 (13.1) |

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|  |  | 13.3,13.4,13.5,13.6) |
| <b>Other Reference books and sources</b> | 1. Strategic Planning & Formulation of Corporate Strategy, V S Ramaswami, S Namaumari, Publication - Macmillan, India.<br>2. Strategic Management, 9 <sup>th</sup> Edition – John A Pearce II, Richard B Robinson, Jr Publication-Tata McGraw- Hill Publishing Company Limited, New Delhi.<br>3. Crafting & Executive Strategy -14 <sup>th</sup> edition, Arthur A. Thompson Jr, A. J. Strickland III, Publication-Tata McGraw- Hill Publishing Company Limited, New Delhi.<br>4. Management Policy & Strategic Management – R. M. Srivastava Publication – Himalaya Publishing House. |                      |

## SEMESTER - IV

| Semester                          | IV   | Course Code      | 4T1 | Type of Course                                      | Elective |  |  |  |
|-----------------------------------|--|------------------|-----|---|----------|--|--|--|
| Course Name                       | <b>MM4: RETAIL SALES MANAGEMENT AND SERVICES MARKETING</b>   |                  |     |   |          |  |  |  |
| Credits                           | 4  | Number of hours: | 40  |   |          |  |  |  |
| <b>Detailed Course Objectives</b> |  |                  |     |   |          |  |  |  |
| <b>CO1</b>                        | On completion of this module the students will be able to <b>utilise</b> the knowledge gained on Retail Industry and the existing retail environment. The student will also be able to <b>plan</b> their retail business as future manager by <b>applying</b> retail segmentation.   |                  |     |   |          |  |  |  |
| <b>CO2</b>                        | On completing this module, the students will be able to <b>take part in</b> the decisions involved in running a retail firm. They will also be able to form their own <b>opinion</b> on various retail formats and <b>recommend</b> strategies for retail planning.  |                  |     |   |          |  |  |  |
| <b>CO3</b>                        | On completing this module, the students will be able to draw <b>relationship</b> between retail merchandising, marketing communication, CRM and retail success: They will also be in a position to <b>predict</b> impact of changing trends in Indian market scenario on retail business.  |                  |     |   |          |  |  |  |
| <b>CO4</b>                        | On completion of this module, the students will be able to <b>analyse</b> concepts, functions, and techniques of the craft of service marketing services and will also be able to <b>identify</b> critical issues in service design & delivery. As future managers they will also be able to <b>adapt</b> a particular model of service marketing to a firm they work with.  |                  |     |   |          |  |  |  |
| <b>CO5</b>                        | On completing this module, the students will be able to <b>examine</b> the <b>application</b> of integrated marketing communication (IMC) to retail business and <b>develop</b> an effective service marketing system for retail business. Students will also be in a position to <b>recommend</b> ethical rules for conduct of retail business in India.  |                  |     |   |          |  |  |  |
| <b>Detailed Contents:</b>         |  |                  |     | <b>Reference Book, Publisher, Edition, Page No.</b> |          |  |  |  |
| <b>Module 1</b>                   | <i>Introduction to Retailing:</i> Introduction, Meaning of Retailing, Economic Significance of Retailing, Retailing Management Decision Process, Product Retailing vs. Service Retailing, Types of Retailers, Retailing Environment, Indian vs. Global Scenario <i>Retail Marketing Environment-</i> In Elements in a Retail Marketing Environment, Environmental Issues <i>The Retail Marketing Segmentation:</i> Segmentation in Retail, Targeted Marketing Efforts, Criteria for Effective Segmentation, Dimensions of Segmentation, Positioning Decisions                        |                  |     |   |          |  |  |  |
| <b>Module 2</b>                   | Store Location and Layout: Introduction, Types of Retail Stores Location, Factors Affecting Retail Location Decisions, Country/Region Analysis, Trade Area Analysis, Site Evaluation, Site Selection, Location Based Retail Strategies <i>Retail Marketing Strategies:</i> Introduction, Target Market and Retail Format, Strategy at different levels of Business, Building a Sustainable Competitive Advantage, the Strategic Retail Planning Process, Retail Models, Retail “EST” model ,the Strategic Retail Planning Process, Differentiation Strategies, Positioning Decisions |                  |     |   |          |  |  |  |

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| <b>Module 3</b>                          | Retail Merchandising: Introduction, Understanding Merchandising Management, Activities of a Merchandiser, Retail Merchandising Management Process Private Branding in Retail-Introduction, Difference between a Store/Private, Brand and a National Brand, Growth Drivers of Private Label, Global Scenario of Private Labels, Indian Market Scenario, Advantages of Private Label, Disadvantages of Private Label<br>Integrated Marketing Communication in Retail, Customer Relationship Management in Retailing- Components of CRM, CRM and Loyalty Program, Technology in Retail Marketing Decisions<br>.                          | Swapna Pradhan, RETAILING MANAGEMENT TEXT & CASES , Tata McGraw Hill Companies., 167-238, 341-360<br>Retail Management , Barry Berman & Joel R Evans, 405-595 |
| <b>Module 4</b>                          | Services Marketing Introduction, concept and evolution of services marketing, meaning of service marketing, myths encountered in services, need for service marketing, and growth in Services Marketing. Services Marketing Mix and Gaps Model Introduction, 7Ps of service marketing, service gaps framework, perceived service quality, models of service marketing. Service Design and Service Delivery Introduction, Service delivery process   | Service Marketing ,S MJha pg no – 1-79,,633-713   |
| <b>Module 5</b>                          | Integrated Services Marketing: Introduction, meaning and Importance, Features of Integrated Service Marketing, Integrated Marketing Communication for Service, Reasons for growing importance of integrated marketing communication, Advantages of integrated marketing communication, Integrated Service Marketing Mix, Developing an effective and efficient service marketing system, Integration of service quality measures and managing quality Emerging Issues in Service Marketing , Service Marketing Research for Global Markets and Rural Markets, Innovations in Services Marketing, Ethical Aspects in Service Marketing | Service Marketing , Valarie Azeuthaml, Dwayne, Mary Bitner & Ajay Pandit pg no-495-562,   |
| <b>Other Reference books and sources</b> | 1. Retailing Management, Michael Levy, Barton Weitz, Dhruv Grewal, McGraw-Hill Education; 10 edition, ISBN-13: 978-1260084764<br>2. Retail Marketing Management, David Gilbert, Pearson Education; 2 edition, ISBN-13: 978-8177588255<br>3. Retail Management, Barry Berman Joel R Evans, Patrali Chatterjee, Ritu Srivastava, Pearson Education; Thirteenth edition, ISBN-13: 978-9332587694<br>4. Services Marketing, Rajendra Nargundkar, McGraw Hill Education; 3 edition, ISBN-13: 978-0070682122  |   |

| Semester | IV | Course Code | 4T1 | Type of Course | Elective |
|----------|----|-------------|-----|----------------|----------|
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|-----------------------------------|--|-------------------------|--|
| <b>Course Name</b>                | <b>FM4: MANAGING BANKS AND FINANCIAL INSTITUTIONS</b>  |                         |  |
| <b>Credits</b>                    | <b>4</b>   | <b>Number of hours:</b> | <b>40</b>  |
| <b>Detailed Course Objectives</b> |  |                         |  |
| <b>CO1</b>                        | The student will be able to <b>identify</b> role of banking in economic development of country.  |                         |  |
| <b>CO2</b>                        | The student will be able to <b>assess</b> the impact of monetary policy and its instruments on banking sector  |                         |  |
| <b>CO3</b>                        | The student will be able to <b>analyse</b> the health and risk of bank balance sheet and will also be able to <b>appraise</b> credit management parameters of a bank |                         |  |
| <b>CO4</b>                        | The student will be able to <b>identify</b> the NPAs and will also be able to <b>appraise</b> the process of securitisation.   |                         |  |
| <b>CO5</b>                        | The student will be able to <b>distinguish</b> the utility of various non banking institutions like insurance, housing finance and credit rating                     |                         |  |
| <b>Detailed Contents:</b>         |  |                         | <b>Reference Book, Publisher, Edition, Page No.</b>  |
| <b>Module 1</b>                   | <b>Nature and role of Financial System-</b> Structure of Financial System, Financial System and Economic Development, Indian Financial System – The Banking System.  |                         | Banks and Institutional Management – A new orientation, 2 <sup>nd</sup> Edition, Vasant Desai, Himalaya Publishing house, ISBN -978-93-5024-093-9, Chapter 2,4&5 |
| <b>Module 2</b>                   | <b>The Reserve Bank of India – Monetary Policy of RBI</b>  |                         | Banks and Institutional Management – A new orientation, 2 <sup>nd</sup> Edition, Vasant Desai, Himalaya Publishing house, ISBN -978-93-5024-093-9, Chapter 7&8   |
| <b>Module 3</b>                   | <b>Commercial Banks and Functions of Commercial Banks , Liabilities of Bank, Credit Management</b>   |                         | Banks and Institutional Management – A new orientation, 2 <sup>nd</sup> Edition, Vasant Desai, Himalaya Publishing house, ISBN -978-93-                          |

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|  |  | 5024-093-9, Chapter 9,10,11&12   |
| <b>Module 4</b>                          | <b>Banking Innovations, NPAs, and Securitisation</b>   | Banks and Institutional Management - A new orientation, 2 <sup>nd</sup> Edition, Vasant Desai, Himalaya Publishing house, ISBN -978-93-5024-093-9, Chapter 13,14&15    |
| <b>Module 5</b>                          | <b>Non Banking Financial Institutions and Services:</b> Life Insurance, General Insurance, Housing Finance, Credit Rating  | Banks and Institutional Management - A new orientation, 2 <sup>nd</sup> Edition, Vasant Desai, Himalaya Publishing house, ISBN -978-93-5024-093-9, Chapter 18,19,23&28 |
| <b>Other Reference books and sources</b> | 1. Bank Financial Management, IIBF, Macmillan Education India (2018), ISBN-13: 978-9387000650<br>2. Advance Bank Management, IIBF, Macmillan Education India (2018), ISBN-13: 978-9387000643<br>3. Bank Management and Financial Services( Indian Edition), Peter Rose & Sylvia Hudgins, 8 <sup>th</sup> Edition, McGraw Hill Education, ISBN-13: 978-9339204815<br>4. Principles And Practice Of Bank Management, 2nd Revised Ediion, Dr. P. Subba Rao & Dr. Promod Kumar Khanna , Himalaya Publishing House, ISBN-13: 978-9350241073 |  |

| Semester                          | IV  | Course Code             | 4T1 | Type of Course | Elective |  |  |  |  |
|-----------------------------------|---|-------------------------|-----|----------------|----------|--|--|--|--|
| <b>Course Name</b>                | <b>HRM4: TEAM DYNAMICS</b>  |                         |     |                |          |  |  |  |  |
| <b>Credits</b>                    | 4   | <b>Number of hours:</b> |     | <b>40</b>      |          |  |  |  |  |
| <b>Detailed Course Objectives</b> |   |                         |     |                |          |  |  |  |  |
| <b>CO1</b>                        | Students should be able to <b>justify</b> the applicability of various theories of Motivation in given situation and appraise the role of motivation in Team Behavior |                         |     |                |          |  |  |  |  |
| <b>CO2</b>                        | Students should be able to <b>determine</b> the importance of Interpersonal Communication and application of FIRO-B and Johari Window.                                |                         |     |                |          |  |  |  |  |

| <b>CO3</b>                | Student should be able to <b>explain</b> the various steps of Group Formation and types of team   |   |  |
|---------------------------|---|---|--|
| <b>CO4</b>                | In a given situation, Students should be able to <b>justify</b> the Conflict resolution strategy.   |   |  |
| <b>CO5</b>                | Students should be able to <b>apply</b> various OD Intervention tools under given situation.  |   |  |
| <b>Detailed Contents:</b> |   | <b>Reference Book, Publisher, Edition, Page No.</b> |  |
| <b>Module 1</b>           | Motivation- Concepts, Theories of Maslow, Herzberg, Application of Motivation concept, Intrinsic and Extrinsic Motivation,Role of Motivation in Team Behavior.  |   | Organisational Behavior – Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, Ch - 6,7,11   |
| <b>Module 2</b>           | Interpersonal Communication- Meaning and Importance of Interpersonal Communication, Transactional Analysis; Discovering the interpersonal orientation through FIRO-B ,Discovering facets of interpersonal trust through Johari window, communication skills, Negotiation skills |   | <p>Organisational Behaviour - Dr. S S Khanka – S.Chand Publication, Ch 11</p> <p>Organisational Behavior – Stephen Robbins; Timothy Judge, Ch 11, 28</p> <p>Seema Sanghi; Pearson Prentice Hall Publication, Ch.2</p> <p>Web site reference:<br/><a href="https://www.themeyersbriggs.com/en-US/Products-and-Services/FIRO">https://www.themeyersbriggs.com/en-US/Products-and-Services/FIRO</a></p> |
| <b>Module 3</b>           | Group and Team Decision making-Concept of Group and Team, synergy of Team work ; Social loafing; Stage of Group Formation, Types of Team, Team Processes, Team Decision making; team morale   |   | <p>Organisational Behavior – Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, Ch 9, 10</p> <p>Organisational Behaviour - Dr. S S Khanka – S.Chand Publication, Ch 15, 16</p>   |
| <b>Module 4</b>           | Conflict Management- Meaning of Conflict , Types of conflict; Levels of Conflict; conflict resolution in teams, competitive vs collaborative behavior, developing collaboration   |   | <p>Organisational Behavior – Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication, Ch 15</p> <p>Organisational Behaviour - Dr. S S Khanka – S.Chand Publication, Ch 17</p>  |

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| <b>Module 5</b>                          | Strategies for Team building and OD- Concept of OD; Process of OD; OD Interventions; Experiential learning methodologies-T- group sensitivity training, encounter groups, appreciative enquiry   | Organisational Behaviour - Dr. S S Khanka – S.Chand Publication, Ch 28Organisational Behavior – Stephen Robbins; Timothy Judge, Seema Sanghi; Pearson Prentice Hall Publication Ch 19 |
| <b>Other Reference books and sources</b> | 1. Group Dynamics for Teams, Daniel J. Levi, SAGE Publications, Inc; Fifth edition, ISBN-13: 978-1483378343<br>2. ORGANISATIONAL BEHAVIOUR: Text & Cases, Uma Sekaran, McGraw Hill Education; 2 edition, ISBN-13: 978-0070581906<br>3. Essentials of Organizational Behavior, 13e, Stephen P. Robbins & Timothy A. Judge, Pearson Education, ISBN-13: 978-9332587984<br>4. Organisational Behaviour, Neeru Vashishtha, Taxmann Publications Private Limited, ISBN-13: 978-8171949991 |   |

| Semester                          | IV  | Course Code      | 4T1 | Type of Course | Elective  |  |  |
|-----------------------------------|---|------------------|-----|----------------|---|--|--|
| Course Name                       | <b>OM4: SALES AND OPERATIONS PLANNING</b>   |                  |     |                |   |  |  |
| Credits                           | 4   | Number of hours: | 40  |                |   |  |  |
| <b>Detailed Course Objectives</b> |   |                  |     |                |   |  |  |
| <b>CO1</b>                        | At the end of the course the student will be able to develop short term, medium term and long term forecasting needs in the organization. |                  |     |                |   |  |  |
| <b>CO2</b>                        | The student will be able to apply forecasting models for forecasting.   |                  |     |                |   |  |  |
| <b>CO3</b>                        | The student will be able to develop aggregate planning by applying aggregate strategies.  |                  |     |                |   |  |  |
| <b>CO4</b>                        | The student will be able to plan MPS and calculate bill of materials and MRP for production plan.   |                  |     |                |   |  |  |
| <b>CO5</b>                        | The students will be able to plan distribution of finished goods taking into consideration various inputs and constraints.                |                  |     |                |   |  |  |
| <b>Detailed Contents:</b>         |   |                  |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |

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| <b>Module 1</b>                          | Need for Operations planning and control, Forecasting – Need for forecasting, Time horizons of forecasting – Short term, Medium term and Long term, Stages of forecasting, Sources of data   | Operations Management, Theory and Practice, By B. Mahadevan, Pearson Publications, Chapter 13 |
| <b>Module 2</b>                          | Models of Forecasting – Time Series, Moving Averages, Causal Methods and Econometric Model   | Operations Management, Theory and Practice, By B. Mahadevan, Pearson Publications, Chapter 13 |
| <b>Module 3</b>                          | Aggregate Planning – Need for Aggregate Production planning, Capacity adjustments, Basic Strategies, Level and Chase Strategies  | Operations Management, Theory and Practice, By B. Mahadevan, Pearson Publications, Chapter 14 |
| <b>Module 4</b>                          | MPS and MRP – Concepts of MPS and MRP, Bill of Materials, Capacity requirement planning, Relation between MPS, CRP and MRP   | Operations Management, Theory and Practice, By B. Mahadevan, Pearson Publications, Chapter 15 |
| <b>Module 5</b>                          | Distribution Planning – Sales Orders, Lead time considerations, Inventory analysis and distribution planning, Use of ERP   | Operations Management, Theory and Practice, By B. Mahadevan, Pearson Publication, Chapter 12s |
| <b>Other Reference books and sources</b> | 1. Sales and Operations Planning, 3 <sup>rd</sup> Edition, T.F. Wallace, Robert A Stahl, T.F. Wallace; Third edition, ISBN-13: 978-8184047394<br>2. Operations Management : Theory and Pract, B. Mahadeva, Pearson Education India; Third edition, ISBN-13: 978-9332547520<br>3. Operations and Supply Chain Management, F. Robert Jacobs & Richard Chase , McGraw Hill Education; Fourteenth edition, ISBN-13: 978-9339204105<br>4. Sales Management – Decision Strategy and Cases, 5 <sup>th</sup> Edition, Richard R. Still, Edward W. Cundiff & Norman Govani, Pearson, ISBN 978-81-317-1089-0 |   |

| Semester                          | IV   | Course Code      | 4T1 | Type of Course | Elective |
|-----------------------------------|--|------------------|-----|----------------|----------|
| Course Name                       | <b>BA4: WEB AND SOCIAL MEDIA ANALYTICS</b> |                  |     |                |          |
| Credits                           | 4  | Number of hours: |     | 40             |          |
| <b>Detailed Course Objectives</b> |  |                  |     |                |          |

| CO1                                      | The student will be able to <b>choose</b> the right tools for website design for measured outcomes.   |   |
|--|---|---|
| CO2                                      | The student will be able to <b>construct</b> a modern metrics of better performance from eight specific metrics for web performance.  |   |
| CO3                                      | The student will be able to <b>develop</b> a model for moving quickly from data to actions on a particular website.   |   |
| CO4                                      | The student will be able to <b>develop</b> the model for measuring the success of a Mobile & Social Media Campaign..  |   |
| CO5                                      | The student will be able to <b>develop</b> a model for the website Outcome.   |   |
| <b>Detailed Contents:</b>                |   |   |
| <b>Module 1</b>                          | <b>Choosing Right Tools for Website :</b> Paradox of data, Defining Web Analytics 2.0 over Click Stream Analysis, Four steps approach for the predetermined success for a website,  | Web Analytics 2.0 By Avinash Kaushik,Wiley International Inc, Publishing House, Chapter 1 & 2     |
| <b>Module 2</b>                          | <b>New Web Analytics 2.0 Mind set :</b> Eight Critical web Metrics. Click Stream Analysis, Best Web Analytics Reports   | Web Analytics 2.0 By Avinash Kaushik,Wiley International Inc, Publishing House, Chapter 3, 4 & 5. |
| <b>Module 3</b>                          | <b>Leveraging Qualitative Data :</b> Lab usability studies, Usability alternatives, Surveys & Web Enabled User Research Options, Power of Testing & Experimentation.  | Web Analytics 2.0 By Avinash Kaushik,Wiley International Inc, Publishing House, Chapter 6 & 7.    |
| <b>Module 4</b>                          | <b>Mobile &amp; Social Media Analytics :</b> Measuring New Social Web - Data Challenge, Analysing Off Line Customer Experiences, Analysing Mobile User Experiences, Measuring the success of blogs, Quantifying the success of Twitter.   | Web Analytics 2.0 By Avinash Kaushik,Wiley International Inc, Publishing House, Chapter 9.        |
| <b>Module 5</b>                          | <b>Website Outcome</b> - Goal Completion, Goal Value, Goal Conversion Rate, Goal abandonment Rate, Goal Reports, Goal Reports, E-Commerce, Shopping Analysis, Product Performance, Sales Performance, affiliate Marketing, Customer Loyalty   | Web Analytics 2.0 By Avinash Kaushik,Wiley International Inc, Publishing House, Chapter 10..      |
| <b>Other Reference books and sources</b> | 1. Social Media Analytics 1/e, Ganis/Kohirkar, Pearson Education India; First edition., ISBN-13: 978-9332578463<br>2. Big Data Analytics Using Splunk: Deriving Operational Intelligence from Social Media, Machine Data, Existing Data Warehouses, and Other Real-Time Streaming Sources (Expert's Voice in Big Data), Peter Zadrozny & Raghu Kodali, Apress; 1st ed. Edition, ISBN-13: 978-1430257615<br>3. Web Analytics Action Hero: Using Analysis to Gain Insight and Optimize Your Business, 1e, Brent Dykes, Pearson Education India, ISBN-13: 978-9332502208<br>4. |   |

| Semester                          | IV  | Course Code      | 4T1 | Type of Course | Elective  |  |  |  |
|-----------------------------------|---|------------------|-----|----------------|---|--|--|--|
| Course Name                       | <b>ED4: ENTREPRENEURIAL MARKETING</b>   |                  |     |                |   |  |  |  |
| Credits                           | 4   | Number of hours: | 40  |                |   |  |  |  |
| <b>Detailed Course Objectives</b> |   |                  |     |                |   |  |  |  |
| CO1                               | The student will be able to <b>interpret</b> the micro and macro environment of the firm  |                  |     |                |   |  |  |  |
| CO2                               | The student will be able to <b>use</b> entrepreneurial approaches to marketing functions.   |                  |     |                |   |  |  |  |
| CO3                               | The student will be able to <b>describe</b> consumer buying decision process  |                  |     |                |   |  |  |  |
| CO4                               | The student will be able to <b>justify</b> the franchising mechanism as a tool for entrepreneurial marketing  |                  |     |                |   |  |  |  |
| CO5                               | The student will be able to <b>justify</b> and <b>elaborate</b> the tools of relationship marketing   |                  |     |                |   |  |  |  |
| <b>Detailed Contents:</b>         |   |                  |     |                | <b>Reference Book, Publisher, Edition, Page No.</b> |  |  |  |
| Module 1                          | Definition of Entrepreneurship Marketing, The entrepreneurship marketing environment, Macro Environment of Entrepreneurial Marketing , Micro Environment of Entrepreneurial Marketing   |                  |     |                |   |  |  |  |
| Module 2                          | Theoretical approaches to marketing in small businesses,Marketing activities by entrepreneurial firm, Entrepreneurial approaches to the marketing functions ; Product, Price, Place, Promotion, Process, People, Physical evidence. |                  |     |                |   |  |  |  |
| Module 3                          | Understanding consumers in entrepreneurship marketing;Levels of involvement and problem-solving types, consumer buying decision process, influences of the buying decision process.   |                  |     |                |   |  |  |  |

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|  |   | Edition 2011, Chapter -6,7&8   |
| <b>Module 4</b>                          | Franchising in entrepreneurship marketing, Benefits, Issues affecting success and failure of Franchising , Steps in establishing a franchise  | Entrepreneurship Marketing, Principles and Practice of SME Marketing by: Sonny Nwankwo Publisher: Routledge First Edition 2011, Chapter 19 |
| <b>Module 5</b>                          | Relationship marketing and networks in entrepreneurship; The Six-Markets Model Of RM; Networks for entrepreneurial RM, The Future direction of RM and Networks  | Entrepreneurship Marketing, Principles and Practice of SME Marketing by: Sonny Nwankwo Publisher: Routledge First Edition 2011, Chapter 15 |
| <b>Other Reference books and sources</b> | 1. Entrepreneurial Marketing: An Effectual Approach, Edwin J. Nijssen, Routledge; 2 edition, ISBN-13: 978-1138712911<br>2. Entrepreneurial Marketing, Ian Cheston, Palgrave Macmillan; New edition, ISBN-13: 978-1137500908<br>3. Entrepreneurial Marketing: Global Perspectives, Zubin Sethna, Rosalind Jones, Paul Harrigan , Emerald Group Publishing Limited, ISBN-13: 978-1781907863 |  |

| Semester                          | IV  | Course Code | 4T1                     | Type of Course | Elective  |  |  |
|-----------------------------------|---|-------------|-------------------------|----------------|-----------|--|--|
| <b>Course Name</b>                | <b>IB4: INTERNATIONAL HUMAN RESOURCE MANAGEMENT</b>   |             |                         |                |           |  |  |
| <b>Credits</b>                    | 4   |             | <b>Number of hours:</b> |                | <b>40</b> |  |  |
| <b>Detailed Course Objectives</b> |   |             |                         |                |           |  |  |
| <b>CO1</b>                        | Students will be able to <b>differentiate</b> between international and domestic HRM and <b>analyze</b> issues in IHRM and competencies of international managers               |             |                         |                |           |  |  |
| <b>CO2</b>                        | Students will be able to <b>understand</b> recruitment and selection process for expatriates and various concepts involved in it such as HR outsourcing                         |             |                         |                |           |  |  |
| <b>CO3</b>                        | Students will be able to <b>perceive</b> concepts involved in training and development of expatriates and concepts such as diversity training and cross cultural team building. |             |                         |                |           |  |  |

|  |   |   |
|--|---|---|
| CO4                                      | Students will be able to <b>understand and examine</b> various international performance management processes and compensation of expatriates   |   |
| CO5                                      | Students will be able to <b>understand and analyze</b> various cultural dimensions, cultural sensitivity as well as should be able to <b>elaborate</b> collective bargaining and employee relations in various countries.   |   |
|  | <b>Detailed Contents:</b>   |   |
| <b>Module 1</b>                          | Concept of international HRM , differences between international and domestic HRM, Strategic role of International HR department, HR cycle, Issues in IHRM , competencies required for international managers   | Gupta S.C., International Human resource Management- text and cases, Macmillan Publication Ch.1 & 2           |
| <b>Module 2</b>                          | HR Planning and Information Systems , recruitment and selection of expatriates, International labour market sources, attracting and selecting international managers and selecting expatriates, selection tests, Adjustment model, HR outsourcing   | Gupta S.C., International Human resource Management- text and cases, Macmillan Publication Ch.3               |
| <b>Module 3</b>                          | Expatriate Training & development: cultural awareness training, cultural integrator, developing an international mind-set, types of cross-cultural training, cultural assimilators, diversity training, cross-cultural team building  | Gupta S.C., International Human resource Management- text and cases, Macmillan Publication Ch.4               |
| <b>Module 4</b>                          | Multinational performance management, performance management of expatriates and variables that influence performance, performance feedback, compensation of expatriates and its various approaches, cultural impact and compensation policy , termination of contract   | Gupta S.C., International Human resource Management- text and cases, Macmillan Publication Ch.5 & 6           |
| <b>Module 5</b>                          | Convergence of cultures, culture change, determinants of culture, importance of cultural sensitivity and its effect on management approaches, Hofstede's cultural dimensions, bridging cultural gap, preference of cultural types of various countries, culture excellence approach, managing diversity, Industrial relations, collective bargaining , trade unions and employee relations across countries                                       | Gupta S.C., International Human resource Management- text and cases, Macmillan Publication Ch.11, 12, 13 & 16 |
| <b>Other Reference books and sources</b> | 1. International Human Resource Management, K. Aswathappa & Sadhna Dash, McGraw Hill Education; 2 edition, ISBN-13: 978-0071077941<br>2. International Human Resource Management, Anne-Wil Harzing, Ashly Pinnington, SAGE Publications India Private Limited; Fourth edition, ISBN-13: 978-9386062895<br>3. International Human Resource Management, Peter J. Dowling, Marion Festing , Allen D. Engle , Cengage Learning India Private Limited, |   |

ISBN-13: 978-9386668585

4. International Human Resource Management, P.L. Rao, Excel Books, ISBN-13: 978-8174465962

| Semester  | IV   | Course Code      | 4P5 | Type of Course | Elective  |  |  |  |  |
|---|--|------------------|-----|----------------|---|--|--|--|--|
| Course Name   | PROJECT WORK AND VIVA VOCE   |                  |     |                |   |  |  |  |  |
| Credits   | 4  | Number of hours: |     | 40             |   |  |  |  |  |
| Detailed Course Objectives  |  |                  |     |                |   |  |  |  |  |
| CO1   | In a specialization domain of his / her choice, student manager will be able to choose an appropriate topic for study and will be able to clearly formulate & state a research problem     |                  |     |                |   |  |  |  |  |
| CO2   | For a selected research topic, student manager will be able to compile the relevant literature and frame hypotheses for research as applicable   |                  |     |                |   |  |  |  |  |
| CO3   | For a selected research topic, student manager will be able to plan a research design including the sampling, observational, statistical and operational designs if any                    |                  |     |                |   |  |  |  |  |
| CO4   | For a selected research topic, student manager will be able to compile relevant data, interpret & analyze it and test the hypotheses wherever applicable                                   |                  |     |                |   |  |  |  |  |
| CO5   | Based on the analysis and interpretation of the data collected, student manager will be able to arrive at logical conclusions and propose suitable recommendations on the research problem |                  |     |                |   |  |  |  |  |
| CO6   | Student manager will be able to create a logically coherent project report and will be able to defend his / her work in front of a panel of examiners                                      |                  |     |                |   |  |  |  |  |
| Detailed Contents:  |  |                  |     |                | Reference Book, Publisher, Edition, Page No.  |  |  |  |  |
| Module 1  | Revision and Review of Business Research Course (1T3) with practical/ application orientation  |                  |     |                | Business Research Methods – William G. Zikmund, 7 <sup>th</sup> Edition, Cengage Learning, ISBN – 978-81-315-0029-3, Chapter 6&7  |  |  |  |  |
| Module 2  | Synopsis proposal formulation – Format, Tools and Techniques   |                  |     |                | <a href="http://intra.tesaf.unipd.it/pettenella/Corsi/ReaserchMethodology/ResearchSynopsisWriting.pdf">http://intra.tesaf.unipd.it/pettenella/Corsi/ReaserchMethodology/ResearchSynopsisWriting.pdf</a> |  |  |  |  |
| 10 instructional hours may be engaged by a designated faculty members while 30 tutorial hours should be engaged by individual project |  |                  |     |                |   |  |  |  |  |

## **supervisors/guides**

### **Guidelines for Project Work and Viva Voce**

1. For Project work a batch of Maximum **TWENTY** students per guide / supervisor has to be allotted by the Institute. The Guide/Supervisor shall act as an internal examiner for project Examination.

2. The guide or the supervisor shall be appointed by the institute and should be teaching to MBA Programme with minimum qualifications as prescribed by AICTE for Assistant Professor. The guide / supervisor shall be responsible for conducting tutorials for allotted number of students under his/her guidance.

3. **ONE copy** of Project work (Printed and hardbound) shall be submitted to the College/Department at least one month before commencement of MBA Sem IV Examination for evaluation purpose. The college/Department shall retain the copy of Project Work for evaluation and the list of 'Project Work Titles' of all students shall be submitted to the University.

#### **4. Following documents must be attached with the project report -**

- i. A certificate from the Supervisor to the effect that the candidate has satisfactorily completed the Project work for not less than one session and that the Project work is the result of the candidates own work and is of sufficiently high standard to warrant its presentation for examination
- ii. A certificate obtained through anti-plagiarism software stating that the original content of the project work report is more than 80% must be attached at the beginning of the project report.
- iii. A declaration by the candidate that the Project is the result of his/her own research work and the same has not been previously submitted to any examination of this University or any other University. The Project shall be liable to be rejected and /or cancelled if found otherwise.
- iv. A pre-approved and duly signed synopsis should be attached at the end of the project report.

Rubric for evaluation of project report and viva voce

#### **Rubric:ProjectSynopsis/ProposalEvaluation**

|  | <b>Excellent (16-20 Marks)</b>  | <b>Good (11-15 Marks)</b>  | <b>Average (6-10 Marks)</b>   | <b>Poor (0-5 Marks)</b>  | <b>Score</b> |
|--|---|--|---|--|--------------|
| <b>Synopsis:</b> Identification of Problem Domain and Detailed analysis of Feasibility, Objectives and Methodology of Project Proposal | <ul style="list-style-type: none"> <li>• Detailed and extensive explanation of the purpose and need of the project</li> <li>• Detailed and extensive explanation of the specifications and the limitations of the existing systems</li> </ul> | <ul style="list-style-type: none"> <li>• Good explanation of the purpose and need of the project</li> <li>• Collects a great deal of information and good study of the existing systems;</li> <li>• Good justification to the objectives;</li> </ul> | <ul style="list-style-type: none"> <li>• Average explanation of the purpose and need of the project;</li> <li>• Moderate study of the existing systems; collects some basic information</li> <li>• Incomplete justification to the</li> </ul> | <ul style="list-style-type: none"> <li>• Moderate explanation of</li> <li>• the purpose and need of the project</li> <li>• Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited</li> </ul> |              |

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  | <ul style="list-style-type: none"> <li>All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified</li> </ul>                        | Methodology to be followed is specified but detailing is not done  | <ul style="list-style-type: none"> <li>objectives proposed; Steps are mentioned but unclear; without justification to objectives</li> </ul>                                    | <ul style="list-style-type: none"> <li>Only Some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly</li> </ul> |  |
| <b>Quality of Literature Review</b>    | <ul style="list-style-type: none"> <li>Information is gathered from multiple, research-based sources.</li> </ul>   | <ul style="list-style-type: none"> <li>Information is gathered from multiple sources.</li> </ul>   | <ul style="list-style-type: none"> <li>Information is gathered from a limited number of sources.</li> </ul>  | <ul style="list-style-type: none"> <li>Information is gathered from a single source.</li> </ul>  |  |
| <b>Project Report and References</b>   | <ul style="list-style-type: none"> <li>Project report is according to the specified format</li> <li>References and citations are appropriate and well mentioned</li> </ul>                             | <ul style="list-style-type: none"> <li>Project report is according to the specified format</li> <li>References and citations are appropriate but not mentioned well</li> </ul> | <ul style="list-style-type: none"> <li>Project report is according to the specified format but some mistakes</li> <li>In-sufficient references and citations</li> </ul>        | <ul style="list-style-type: none"> <li>Project report not prepared according to the specified format</li> <li>References and citations are not appropriate</li> </ul>                      |  |
| <b>Discussion and Conclusions</b>      | <ul style="list-style-type: none"> <li>Discussion and conclusions tie the problem statement, experiments, and results well to tell an overall story.</li> <li>Future work clearly outlined.</li> </ul> | <ul style="list-style-type: none"> <li>Some discussion and conclusions drawn, but missing some points in terms of linkage of results to problem statement</li> </ul>           | <ul style="list-style-type: none"> <li>Major components missing in the discussion.</li> <li>Little attempt to tie together experiments and problem statement/claims</li> </ul> | <ul style="list-style-type: none"> <li>Little discussion or conclusions drawn.</li> </ul>  |  |
| <b>Oral Presentation and viva voce</b> | <ul style="list-style-type: none"> <li>Contents of presentations are appropriate and well delivered</li> </ul>   | <ul style="list-style-type: none"> <li>Contents of presentations are appropriate but not well delivered</li> <li>Eye contact with</li> </ul>                                   | <ul style="list-style-type: none"> <li>Contents of presentations are appropriate but not well delivered</li> <li>Eye contact with</li> </ul>                                   | <ul style="list-style-type: none"> <li>Contents of presentations are not appropriate and not well delivered</li> <li>Poor eye contact</li> </ul>   |  |

|  |   |   |  |   |  |
|--|---|---|--|---|--|
|  | <ul style="list-style-type: none"> <li>Contents of presentations are appropriate and well delivered</li> <li>Clear voice with good spoken language but less eye contact with audience</li> <li>Comprehensive Q&amp;A for all questions</li> </ul> | <ul style="list-style-type: none"> <li>only few people and unclear voice</li> <li>Comprehensive Q&amp;A for some questions</li> </ul> | <ul style="list-style-type: none"> <li>only few people and unclear voice</li> <li>Average Q&amp;A</li> </ul> | <ul style="list-style-type: none"> <li>with audience and unclear voice</li> <li>Poor Q&amp;A</li> </ul> |  |
|--|---|---|--|---|--|

| Semester                   | IV  | Course Code      | 4S6 | Type of Course | Elective |  |  |  |
|----------------------------|---|------------------|-----|----------------|----------|--|--|--|
| Course Name                | EXIT SEMINAR AND OPEN DEFENCE   |                  |     |                |          |  |  |  |
| Credits                    | 4   | Number of hours: | 40  |                |          |  |  |  |
| Detailed Course Objectives |   |                  |     |                |          |  |  |  |
| CO1                        | The student will be able to <b>apply</b> knowledge of management theories and practices to solve business problems  |                  |     |                |          |  |  |  |
| CO2                        | The student will <b>Foster</b> Analytical and Critical thinking abilities for data-based decision making  |                  |     |                |          |  |  |  |
| CO3                        | The student will <b>acquire</b> Ability to develop Value Based Leadership ability   |                  |     |                |          |  |  |  |
| CO4                        | The student will <b>develop</b> the Ability to understand, analyse and communicate global, economic, legal, and ethical areas of business                             |                  |     |                |          |  |  |  |
| CO5                        | The student will <b>acquire</b> the Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment. |                  |     |                |          |  |  |  |

#### Guidelines and Format for Exit Seminar and Open Defence

Exit Seminar is a culmination and presentation of all the learning that has happened in last 4 semesters of MBA program. The idea is to check the key learnings of a student manager and to map them with the program outcomes so as to assess the attainment of program outcomes. The Viva-Voce should be targeted at assessment of

following POs.

**MBA Program Outcomes:**

1. Apply knowledge of management theories and practices to solve business problems
2. Foster Analytical and Critical thinking abilities for data-based decision making
3. Ability to develop Value Based Leadership ability
4. Ability to understand, analyse and communicate global, economic, legal, and ethical areas of business
5. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

This will also present the student portfolio evaluation i.e. a systematic and organized collection of a student's work that exhibits the direct evidence of a student's efforts, achievements and progress over a period of time including Theory Papers, SIP, Live Projects, MOOCs, etc.

**Format for Presentation-**

Presentation should include following-

1. Summary of Learnings from core courses across semesters
2. Summary of Learning from elective 1 courses
3. Summary of Learning from elective 2 courses
4. Summary of Learning from MOOCs
5. Summary of Learning from Summer Internship Project
6. Summary of Learning from Project Work
7. Exhibition of student portfolio i.e. a systematic and organized collection of a student's work that exhibits the direct evidence of a student's efforts, achievements and progress over a period of time including Theory Papers, SIP, Live Projects, MOOCs, etc.
8. Level of Attainment of PO1 with justification
9. Level of Attainment of PO2 with justification
10. Level of Attainment of PO3 with justification
11. Level of Attainment of PO4 with justification
12. Level of Attainment of PO5 with justification
13. Concluding Remark

**Open Defence** - The external examiner should ask questions to check the attainment of 5 POs

**Evaluation of Exit Seminar:**

- The individual presentation should ideally last for 15-20 minutes followed by Open Defence Question-Answer session (10-15 minutes).
- The External Examiner (appointed by the University) should evaluate Maximum 20 (Maximum 10 at One Institute) Exit Seminars.

**Rubric for Evaluation-** the external examiners based on exit seminar, presentation and open defence performance shall evaluate the student as Excellent (9-10 marks), Good (5-8 marks) or Average (0-4 marks) and mention the score in the rubric

|   |  |              |
|---|--|--------------|
| <b>Name of Institute:</b>   |  |              |
| <b>Name of Student:</b>   |  |              |
| <b>Roll No. :</b>   | <b>Enrolment No.:</b>                  |              |
| <b>Parameter</b> [Excellent (9-10 marks), Good (5-8 marks) or Average (0-4 marks)]  |  | <b>Score</b> |
| <b>Learnings from core courses</b>  |  |              |
| <b>Learnings from elective 1 courses</b>  |  |              |
| <b>Learnings from elective 2 courses</b>  |  |              |
| <b>Learnings from SIP/ Project</b>  |  |              |
| <b>Assessment of Student Portfolio</b>  |  |              |
| <b>Attainment of PO1</b> (Apply knowledge of management theories and practices to solve business problems)  |  |              |
| <b>Attainment of PO2</b> (Foster Analytical and Critical thinking abilities for data-based decision making)   |  |              |
| <b>Attainment of PO3</b> (Ability to develop Value Based Leadership ability)  |  |              |
| <b>Attainment of PO4</b> (Ability to understand, analyse and communicate global, economic, legal, and ethical areas of business)                            |  |              |
| <b>Attainment of PO5</b> (Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment) |  |              |
| <b>Name of Examiner:</b>  | <b>Signature of Examiner and Date:</b> |              |
| <hr/> <hr/>   |  |              |



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

## Department of Electronics & Telecommunication

**SESSION : 2021-22 (EVEN)**

### Faculty Contact Hours

| Sr. No | Name of Faculty         | Theory(Th1+Th2)      |   |   |   |   |       |     |  |  | Theory contact Hours<br>(A) | Practical(Lab1+Lab2) |   |       | Practical contact Hours<br>(B+C+D) | Project Contact Hours<br>(E) | Total Contact Hours<br>(A+B+C+D+E) |    |      |       |         |         |
|--------|-------------------------|----------------------|---|---|---|---|-------|-----|--|--|-----------------------------|----------------------|---|-------|------------------------------------|------------------------------|------------------------------------|----|------|-------|---------|---------|
|        |                         | TH1                  |   |   | L | T | Total | TH2 |  |  |                             | L                    | T | Total | TH3                                |                              |                                    | L  | T    | Total | Lab1(B) | Lab2(C) |
| 1      | Prof. Sushma Telrandha  | UC & A 4th Sem (ETC) | 4 | 1 | 5 |   |       |     |  |  |                             |                      |   |       | 5                                  |                              |                                    |    | MRE  | 2     | 6       | 13      |
| 2      | Prof. Amar Banmare      |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  | ADE  | 2     | 6       | 13      |
| 3      | Prof. Deepak Deshpande  |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  | DCOM | 2     | 6       | 13      |
| 4      | Prof. Nayan Shambharkar |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  | CCN  | 2     | 6       | 13      |
| 5      | Prof. Sharon Bhatnagar  |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  | EWP  | 2     | 6       | 13      |
| 6      | Prof. Suvarna Talatule  |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  |      |       |         | 5       |
| 7      | Prof. Abhay Satmohankar |                      |   |   |   |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 5  | DSP  | 2     |         | 7       |
| 8      | Prof. Kajal Dhawale     | ASD 4th Sem (ETC)    | 4 | 1 | 5 |   |       |     |  |  |                             |                      |   |       | 4                                  | 1                            | 5                                  | 10 |      |       |         | 10      |

|           |                       |                     |   |   |   |  |  |                   |   |   |   |      |  |  |  |   |   |           |
|-----------|-----------------------|---------------------|---|---|---|--|--|-------------------|---|---|---|------|--|--|--|---|---|-----------|
| <b>9</b>  | Prof. Yeshwant Deodhe | NA&PM 4th Sem (ETC) | 4 | 1 | 5 |  |  |                   |   |   | 5 | UC&A |  |  |  | 2 |   | 7         |
| <b>10</b> | Prof. Harana Bodele   |                     |   |   |   |  |  | MRE 8th Sem (ETC) | 4 | 1 | 5 | 5    |  |  |  |   | 6 | <b>11</b> |
| <b>11</b> | Prof. Sandip Buradkar |                     | 4 | 1 | 5 |  |  |                   |   |   | 5 |      |  |  |  |   | 6 | <b>11</b> |
| <b>12</b> | Prof. Nilesh Mohota   |                     |   |   |   |  |  | CCN 8th Sem (ETC) | 4 | 1 | 5 | 5    |  |  |  |   | 6 | <b>11</b> |

#### Faculty from other Department

|           |                        |                   |   |   |   |                  |   |   |   |  |  |   |     |  |  |   |  |   |
|-----------|------------------------|-------------------|---|---|---|------------------|---|---|---|--|--|---|-----|--|--|---|--|---|
| <b>13</b> | Prof. Puja Nagpure     |                   |   |   |   | FE 6th Sem (ETC) | 4 | 1 | 5 |  |  | 5 |     |  |  |   |  | 5 |
| <b>14</b> | Prof. Shweta Ramteke   | ADE 4th Sem (ETC) | 4 | 1 | 5 |                  |   |   |   |  |  | 5 | PDS |  |  | 2 |  | 7 |
| <b>15</b> | Prof. Tejaswini Ambate | PPS 4th Sem (ETC) | 4 | 1 | 5 |                  |   |   |   |  |  | 5 |     |  |  |   |  | 5 |

#### Faculty to other Department

|           |                     |  |  |  |                                  |   |   |  |  |  |  |   |    |  |  |   |  |   |
|-----------|---------------------|--|--|--|----------------------------------|---|---|--|--|--|--|---|----|--|--|---|--|---|
| <b>16</b> | Prof. Akansha Kale  |  |  |  | Digital Electronics 4th sem (EE) | 4 | 1 |  |  |  |  | 5 | DE |  |  | 2 |  | 7 |
| <b>17</b> | Prof. Meher Lalwani |  |  |  | S&S 4th Sem (EE)                 | 4 | 1 |  |  |  |  | 5 |    |  |  |   |  | 5 |





# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

Dahegaon, Kalmeshwar Road, Nagpur – 441501. Phone No. 07118-661400

## Department of Electrical Engineering

Session 2021-22

### Teaching Load Calculation BE (Even semester)

#### BE

| Sr. No. | Semester | Subject                               | Theory (Hrs)         | Practical       |                   | Total Practical Hours | Total Load    |
|---------|----------|---------------------------------------|----------------------|-----------------|-------------------|-----------------------|---------------|
|         |          |                                       |                      | Practical (Hrs) | Practical Batches |                       |               |
| 1       | IV Sem A | Electrical machines-I                 | 3 hrs                | 2               | 1                 | 1 x 2 = 2 hrs         | 5 hrs         |
| 2       |          | Power System                          | 3 hrs                | -----           | -----             | -----                 | 3 hrs         |
| 3       | IV Sem B | Electrical machines-I                 | 3 hrs                | 2               | 1                 | 1x 2 = 2 hrs          | 5 hrs         |
| 4       |          | Power System                          | 3 hrs                | -----           | -----             | -----                 | 3 hrs         |
| 5       | VI Sem   | Electrical Drives & Their Control     | 4 hrs                | -----           | -----             | -----                 | 4 hrs         |
| 6       |          | Power Station Practice                | 4 hrs                | -----           | -----             | -----                 | 4 hrs         |
| 7       |          | Power Electronics                     | 5 hrs                | 2               | 1                 | 1 x 2 = 2 hrs         | 7 hrs         |
| 8       |          | Control System-I                      | 5hrs                 | 2               | 1                 | 1 x 2 = 2 hrs         | 7 hrs         |
| 9       |          | Industrial Visits & Report Writing    |                      | 2               | 1                 | 1 x 2 = 2 hrs         | 2 hrs         |
| 10      | VIII Sem | EHV AC & HVDC                         | 4 hrs                | -----           | -----             | -----                 | 4 hrs         |
| 11      |          | Computer Applications to Power System | 5 hrs                | 2               | 1                 | 1 x 2 = 2hrs          | 7 hrs         |
| 12      |          | Electrical Distribution System        | 4 hrs                | -----           | -----             | -----                 | 4 hrs         |
| 13      |          | Switch Gear & Protection              | 5 hrs                | 2               | 1                 | 1 x 2 = 2 hrs         | 7 hrs         |
| 14      |          | Project                               | -----                | 2               | 15                | 15x 2 = 30hrs         | 30 hrs        |
| Total   |          |                                       | (44-6<br>=38)<br>hrs |                 |                   | (44 -2=42)hrs         | (92-8 =84)hrs |

**Load from other Department :**

| Sr. No. | Semester | Subject                                       | Department | Theory (Hrs) | Practical       |                   | Total Practical Hours | Total Load |
|---------|----------|---|------------|--------------|-----------------|-------------------|-----------------------|------------|
|         |          |   |            |              | Practical (Hrs) | Practical Batches |                       |            |
| 1       | IV Sem A | Signal & Systems                              | ETC        | 4 hrs        | -----           | -----             | -----                 | 4 hrs      |
| 2       |          | Digital Electronics                           | ETC        | 3 hrs        | 2               | 1                 | 1 x 2 = 2 hrs         | 5 hrs      |
|         |          | Electromagnetic Fields                        | ETC        | 4 hrs        | -----           | -----             | -----                 | 4 hrs      |
|         |          | Simulation & Programming Techniques           | CSE        | 3 hrs        | 2               | 1                 | 1 x 2 = 2 hrs         | 5 hrs      |
| 3       | IV Sem B | Signal & Systems                              | ETC        | 4 hrs        | -----           | -----             | -----                 | 4 hrs      |
| 4       |          | Digital Electronics                           | ETC        | 3 hrs        | 2               | 3                 | 1 x 2 = 2 hrs         | 5 hrs      |
|         |          | Electromagnetic Fields                        | ETC        | 4 hrs        | -----           | -----             | -----                 | 4 hrs      |
|         |          | Simulation & Programming Techniques           | CSE        | 3 hrs        | 2               | 3                 | 1 x 2 = 2 hrs         | 5 hrs      |
| 5       | VI Sem   | Engineering Economics & Industrial Management | MBA        | 4 hrs        | -----           | -----             | -----                 | 4 hrs      |
|         |          | Functional English                            | MBA        | 2 hrs        | -----           | -----             | -----                 | 2 hrs      |
| Total   |          |   |            | 34           |                 |                   | 8 hrs                 | (42-18=24) |

## **Load Summary of other Departments**

| Sr. No. | Department   | Load in Hrs |
|---------|--------------|-------------|
| 1.      | <b>ETC</b>   | 13          |
| 2.      | <b>CSE</b>   | 05          |
| 3.      | <b>MBA</b>   | 06          |
|         | <b>Total</b> | <b>24</b>   |

## **Subject Distribution (Semester wise)**

### **BE Electrical**

| Sr. No. | Semester | Name of Subject /Practical         | Name of Faculty                             |
|---------|----------|------------------------------------|---|
| 1       | IV Sem A | Electrical machines-I              | Prof. Akshay Pillewan                       |
|         |          | Electrical machines-I Practical    | Prof. Ankita Bhimgade                       |
|         |          | Power System                       | Prof. Ankita Bhimgade                       |
|         |          | EMF                                | Prof. Yogesh Likhar                         |
| 2       | IV Sem B | Electrical Machines-I              | Prof. Kavita Patil                          |
|         |          | Electrical machines-I Practical    | Prof. Sneha Masarkar, Prof. Yogesh Gajbhiye |
|         |          | Power System                       | Prof. Kanchan Bande                         |
|         |          | SPT                                | Prof. Sneha Masarkar                        |
|         |          | S& S                               | Prof. Eshita Dupare                         |
|         |          | EMF                                | Prof. Saraswati Mishra                      |
| 3       | VI Sem   | ELECTRICAL DRIVES & THEIR CONTROL  | Prof. Akshay Pillewan                       |
|         |          | POWER STATION PRACTICE             | Prof. Milind Rode                           |
|         |          | POWER ELECTRONICS                  | Prof. Pallavi Barekar                       |
|         |          | POWER ELECTRONICS Lab              | Prof. Pallavi Barekar, Prof. Syeda Saba     |
|         |          | CONTROL SYSTEM-I                   | Prof. Yogesh Likhar                         |
|         |          | CONTROL SYSTEM-I Lab               | Prof. Rutuja Zade                           |
|         |          | INDUSTRIAL VISITS & REPORT WRITING | Prof. Ankita Bhimgade                       |
| 4       | VIII Sem | EHV AC & HVDC                      | Prof. Milind Rode                           |
|         |          | CAPS (Theory + Practical)          | Prof. Manish Agrawal                        |

|  |  |                          |   |
|--|--|--------------------------|---|
|  |  | EDS                      | Prof. R. M. Bhombe  |
|  |  | SGP (Theory + Practical) | Prof. Diksha Khare  |
|  |  | Project                  | Prof. Akshay Pillewan, Prof. Manish Agrawal, Prof. Milind Rode, Prof. Kanchan Bande, Prof. Ankita Bhimgade, Prof. Pallavi Barekar |

### Faculty wise Load

| Sr.<br>No. | Name of Faculty       | Semester | Subject                              | Theory | Practical | Project | Total |
|------------|-----------------------|----------|--------------------------------------|--------|-----------|---------|-------|
|            |                       | UG       | UG                                   | UG     | UG        | UG      |       |
| 1          | Prof. R.M. Bhombe     | VI, VIII | EDS, Project                         | 4      |           | 04      | 8     |
| 2          | Prof. Diksha Khare    | VIII     | SGP (Th+ Lab), Project               | 5      | 2         | 04      | 11    |
| 3          | Prof. Akshay Pillewan | IV A, VI | EMC-I ,EDTC, EMC-I Lab ,Project      | 8      | 02        | 04      | 14    |
| 4          | Prof. Yogesh Likhar   | IVA, VI  | EMF,CS-I(Th)                         | 9      | -----     | 04      | 13    |
| 5          | Prof. Manish Agrawal  | VIII     | CAPS (Th + Lab), CS I LAB . Project, | 5      | 4         | 04      | 13    |
| 6          | Prof. Milind Rode     | VI, VIII | EHV AC & HVDC, PSP, Project          | 8      | -----     | 02      | 10    |
| 7          | Prof. Kanchan Bande   | IVB      | EMC-I BE Project                     | 3      | -----     | 04      | 7     |
| 8          | Prof. Ankita Bhimgade | IVA, VI  | PS , EMC-I Lab , IVRW Lab, Project   | 3      | 4         | 02      | 9     |
| 9          | Prof. Pallavi Barekar | VI       | Power Electronics (Th +Lab), Project | 5      | 2         | 02      | 9     |
| 10         | Prof.Kavita Patil     | IV B     | EMC-I                                | 3      | -----     |         | 3     |
| 11         | Prof.Sneha Masarkar   | IV B     | SPT, EMC-I Lab                       | 3      | 2         |         | 5     |
| 12         | Prof.Yogesh Gajbhiye  | IV B     | EMC-I Lab                            | -----  | 2         |         | 2     |

|       |                       |      |          |       |       |    |     |
|-------|-----------------------|------|----------|-------|-------|----|-----|
| 13    | Prof.Syeda Saba       | VI   | PE LAB   | ----- | 2     |    | 2   |
| 14    | Prof.Rutuja Zade      | VI   | CS I LAB | ----- | 2     |    | 2   |
| 15    | Prof. Eshita Dupare   | IV B | S AND S  | 4     | ----- |    | 4   |
| 16    | Prof.Pradeep Barde    | IV B | DLEC     | 3     | ----- |    | 3   |
| 17    | Prof.Saraswati Mishra | IV B | EMF      | 4     | ----- |    | 4   |
| Total |                       |      |          | 67    | 20    | 30 | 117 |

**HoD, EE**



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

Dahegaon, Kalmeshwar Road, Nagpur – 441501. Phone No. 07118-661400

## Department of Electrical Engineering

Session 2021-22

Teaching Load Calculation (even semester)

**Mtech**

| Sr. No. | Semester | Subject   | Theory (Hrs) | Practical       |                   | Total Practical Hours | Total Load |
|---------|----------|---|--------------|-----------------|-------------------|-----------------------|------------|
|         |          |   |              | Practical (Hrs) | Practical Batches |                       |            |
| 1       | II       | HVDC and FACTS                                      | 4            | -----           | -----             | -----                 | 4 hrs      |
| 2       |          | Power Quality                                       | 4            | 2               | 1                 | 2 hrs                 | 6 hrs      |
| 3       |          | Advanced Electrical Drives                          | 4            | 2               | 1                 | 2 hrs                 | 6 hrs      |
| 4       |          | Elective –III (Core)<br>Energy Audit and Management | 4            | -----           | -----             | -----                 | 4 hrs      |
| 5       |          | Research Methodology                                | 4            | -----           | -----             | -----                 | 4 hrs      |
| Total   |          |   | 20           |                 |                   | 04 hrs                | 24 hrs     |

### **Subject Distribution (Semester wise)**

#### **Electrical**

#### **M. Tech PEPS**

| Sr. No. | Semester     | Name of Subject /Practical                       | Name of Faculty      |
|---------|--------------|--|----------------------|
| 1       | Mtech II sem | HVDC and FACTS                                   | Prof. Hitesh Murkute |
|         |              | Power Quality (Theory + Practical)               | Prof. Sneha Masarkar |
|         |              | Advanced Electrical Drives (Theory + Practical)  | Prof. Yogesh Likhar  |
|         |              | Elective –III (Core) Energy Audit and Management | Prof. Diksha Khare   |
|         |              | Research Methodology                             | Prof. Sneha Masarkar |

#### **Faculty wise Load**

| Sr.No | Name of Faculty      | PG Subjects                                     | Theory | Practical | Total |
|-------|----------------------|---|--------|-----------|-------|
| 1     | Prof. Hitesh Murkute | HVDC and FACTS                                  | 4      | ----      | 4     |
| 2     | Prof. Yogesh Likhar  | Advanced Electrical Drives (Theory + Practical) | 4      | 2         | 6     |
| 3     | Prof. Diksha Khare   | Energy Audit and Management                     | 4      | ---       | 4     |
| 4     | Prof.Sneha Masarkar  | Power Quality (Theory + Practical),RM           | 8      | 2         | 10    |

**HoD, EE**



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

Dahegaon, Kalmeshwar Road, Nagpur – 441501. Phone No. 07118-661400

## Department of Electrical Engineering

Session 2021-22

Teaching Load Calculation (Odd semester)

**Mtech**

| Sr. No. | Semester | Subject   | Theory (Hrs) | Practical       |                   | Total Practical Hours | Total Load |
|---------|----------|---|--------------|-----------------|-------------------|-----------------------|------------|
|         |          |   |              | Practical (Hrs) | Practical Batches |                       |            |
| 1       | I        | Advanced Power Electronic                         | 4            | 2               | 1                 | 2 hrs                 | 6 hrs      |
| 2       |          | Advance Control Theory                            | 4            | ----            |                   |                       | 4 hrs      |
| 3       |          | Power System Modeling                             | 4            | 2               | 1                 | 2 hrs                 | 6 hrs      |
| 4       |          | Elective -II(Core)<br>Energy Audit and Management | 4            | -----           | -----             | -----                 | 4 hrs      |
| 5       |          | Elective -I PSDC                                  | 4            | ----            | -----             | -----                 | 4 hrs      |
| Total   |          |   | 20           |                 |                   | 04 hrs                | 24 hrs     |

## Subject Distribution (Semester wise)

### Electrical

#### M. Tech PEPS

| Sr. No. | Semester    | Name of Subject /Practical                     | Name of Faculty      |
|---------|-------------|--|----------------------|
| 1       | Mtech I sem | Advanced Power Electronic (Theory + Practical) | Prof. Hitesh Murkute |
|         |             | Advance Control Theory                         | Prof. Sneha Masarkar |
|         |             | Power System Modeling (Theory + Practical)     | Prof. Yogesh Likhar  |
|         |             | Elective –II(Core) Energy Audit and Management | Prof. Diksha Khare   |
|         |             | Elective –I PSDC                               | Prof. Sneha Masarkar |

#### Faculty wise Load

| Sr.No | Name of Faculty      | PG Subjects                                     | Theory | Practical | Total |
|-------|----------------------|---|--------|-----------|-------|
| 1     | Prof. Hitesh Murkute | HVDC and FACTS                                  | 4      | ----      | 4     |
| 2     | Prof. Yogesh Likhar  | Advanced Electrical Drives (Theory + Practical) | 4      | 2         | 6     |
| 3     | Prof. Diksha Khare   | Energy Audit and Management                     | 4      | ---       | 4     |
| 4     | Prof.Sneha Masarkar  | Power Quality (Theory + Practical),RM           | 8      | 2         | 10    |

**HoD, EE**



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

Dahegaon, Kalmeshwar Road, Nagpur

## Department of Computer Science and Engineering

SESSION 2021-2022 (EVEN)

Teaching Contact Hours Calculation for Academic Session (UG)

| SR.<br>NO. | NAME OF FACULTY                       | THEORY       |          |               | THEORY<br>LOAD | PRACTICAL   |          |               | Project | PRACTICAL<br>LOAD | CREDENTIAL<br>LOAD | TOTAL<br>LOAD |
|------------|---------------------------------------|--------------|----------|---------------|----------------|-------------|----------|---------------|---------|-------------------|--------------------|---------------|
|            |                                       | IVth<br>SEM  | VIth SEM | VIIIth<br>SEM | (A)            | IVth<br>SEM | VIth SEM | VIIIth<br>SEM |         |                   |                    |               |
| 1          | Prof. Ayaz Ahmed Khan                 | SP           |          | ICS           |                |             |          | ICS           |         |                   |                    |               |
|            |                                       | 5            | -        | 6             | 11             | -           | -        | 2             | 5       | 7                 | -                  | 18            |
| 2          | Prof. Kalpana Malpe                   | TOC          |          | DF            |                |             |          |               |         |                   |                    |               |
|            |                                       | 5            | -        | 6             | 11             | -           | -        | -             | 5       | 5                 | -                  | 16            |
| 3          | Prof. Vijaya Kamble                   |              | SEPM     | DOS           |                |             |          |               |         |                   |                    |               |
|            |                                       | -            | 5        | 6             | 11             | -           | -        | -             | 5       | 5                 | -                  | 16            |
| 4          | Prof. Shubhangi Ghadinkar             | DSPD         |          | CCC           |                | DSPD        |          |               |         |                   |                    |               |
|            |                                       | 5            | -        | 6             | 11             | 6           | -        | -             | 2       | 8                 | -                  | 19            |
| 5          | Prof. Shweta Ramteke                  | DSA          |          |               |                | DSA         |          |               |         |                   |                    |               |
|            |                                       | 3            |          | -             | 10             | 4           | -        | -             | 2       | 2                 | -                  | 12            |
| 6          | Prof. Minal Ualinkar                  | SP           | DP       |               |                | DSPD        | DP       |               |         |                   |                    |               |
|            |                                       | 4            | 5        | -             | 9              | 6           | 4        | -             | 2       | 7                 | -                  | 13            |
| 7          | Prof. Tejaswini Amte                  | CN           | CN       |               |                |             | CN       |               |         |                   |                    |               |
|            |                                       | 5            | 5        | -             | 6              |             | 4        | -             | 2       | 10                | -                  | 16            |
| 8          | Prof. Pranjali Padole                 | PPS<br>(ETC) | AI       |               |                |             |          |               |         |                   |                    |               |
|            |                                       | 2            | 5        |               | 6              |             | -        | -             | 2       | 8                 | -                  | 14            |
| 9          | Prof. Ankita Gaware                   | DBMS         |          |               |                | DBMS        |          | DOS           |         |                   |                    |               |
|            |                                       | 5            |          |               | 6              | 6           | -        | 2             | 2       | 10                | -                  | 16            |
| 10         | Prof. Sandeep Bhongade (ASH<br>Dept.) | DMGT         |          |               |                |             |          |               |         |                   |                    |               |
|            |                                       | 5            | -        | -             | 4              | -           | -        | -             | -       | -                 | -                  | 5             |
| 11         | Prof. Vinita Dighorikar (Other Dept.) |              | FE       |               |                |             |          |               |         |                   |                    |               |
|            |                                       | -            | 5        | -             | 5              | -           | -        | -             | -       | -                 | -                  | 5             |

| Faculty List    |           |   |                      |                             |  |                       |
|-----------------|-----------|---|----------------------|-----------------------------|--|-----------------------|
| FOURTH SEMESTER |           |   |                      |                             |  |                       |
| Sr. No.         | Code      | Name of Subject                           | Subject Abbreviation | Theory (TH) /Practical (PR) | Name of Faculty  | Faculty Abbreviation  |
| 1               | BE4S1T    | Discrete Mathematics And Graph Theory     | DMGT                 | TH                          | Mrs. Sandeep Bhongade  | SB                    |
| 2               | BE4S2T    | Data Structures & Program Design          | DSPD                 | TH                          | Ms. Shubhangi Ghadinkar  | SG                    |
| 3               | BE4S3T    | Database Management System                | DBMS                 | TH                          | Mrs. Ankita Gaware   | AG                    |
| 4               | BE4S4T    | Computer Networks                         | CN                   | TH                          | Mrs. Tejaswini Amte  | TA                    |
| 5               | BE4S5T    | Theory of Computation                     | TOC                  | TH                          | Ms. Kalpana Malpe  | KM                    |
| 6               | BE4S6T    | System Programming                        | SP                   | TH                          | Mr. Ayaz Ahmed Khan  | AK                    |
| 7               | BE4S2P    | Data Structures & Program Design          | DSPD Lab             | PR                          | Ms. Shubhangi Ghadinkar  | SG                    |
| 8               | BE4S3P    | Database Management System Lab            | DBMS Lab             | PR                          | Mrs. Ankita Gaware   | AG                    |
| 9               | BE4S6     | Computer Workshop - II                    | CWS-II Lab           | PR                          | Mrs. Vijaya Kamble   | VK                    |
| SIXTH SEMESTER  |           |   |                      |                             |  |                       |
| 9               | BECSE306T | Artificial Intelligence                   | AI                   | TH                          | Ms. Pranjali Padole  | PP                    |
| 10              | BECSE307T | Design Patterns                           | DP                   | TH                          | Mrs. Minal Ukinkar   | MU                    |
| 11              | BECSE308T | Software Engineering & Project Management | SEPM                 | TH                          | Ms. Vijaya Kamble  | VK                    |
| 12              | BECSE309T | Computer Networks                         | CN                   | TH                          | Mrs. Tejaswini Amte  | TA                    |
| 13              | BECSE310T | Fundamental English                       | FE                   | TH                          | Ms. Vinita Dighorikar  | VD                    |
| 14              | BECSE307P | Design Patterns lab                       | DP (PR)              | PR                          | Mrs. Minal Ukinkar   | MU                    |
| 15              | BECSE309P | Computer Networks Lab                     | CN (PR)              | PR                          | Mrs. Tejaswini Amte  | TA                    |
| 16              | BECSE311P | Mini Project                              | MP                   | PR                          | Ms. Ayaz Khan, Ms. Vijaya Kamble , Mrs. Kalpana Malpe, Ms. Shubhangi Ghadinkar, Ms. Shweta Ramteke, Mrs. Minal Ukinkar | AK, VK, KM, SG SR, MU |
| EIGHT SEMESTER  |           |   |                      |                             |  |                       |
| 16              | BECSE406T | Distributed Operating system              | DOS                  | TH                          | Ms. Vijaya Kamble  | VK                    |
| 17              | BECSE407T | Information & Cyber Security              | ICS                  | TH                          | Mr. Ayaz Khan  | AK                    |
| 18              | BECSE408T | Clustering & Cloud Computing              | CCC                  | TH                          | Ms. Shubhangi Ghadinkar  | SG                    |
| 19              | BECSE409T | Digital Forensic                          | DF                   | TH                          | Mrs. Kalpana Malpe   | KM                    |
| 20              | BECSE406P | Distributed Operating system Lab          | DOS (PR)             | PR                          | Ms. Vijaya Kamble  | VK                    |
| 21              | BECSE407P | Information & Cyber Security Lab          | ICS (PR)             | PR                          | Mr. Ayaz Khan  | AK                    |
| 22              | BECSE410P | Project                                   | PROJECT              | PR                          | Mr. Ayaz Khan, Ms. Vijaya Kamble, Mrs. Kalpana Malpe   | AK, VK, KM            |

## **DEPARTMENT OF MBA**

### **First Semester**

#### Teaching Load Calculation

| Sr. No. | Semester (Odd) | Subject   | Theory | Total Load |
|---------|----------------|---|--------|------------|
| 1       | I              | MANAGERIAL ECONOMICS                                | 4      | 4          |
| 2       |                | MANAGEMENT INFORMATION SYSTEM                       | 4      | 4          |
| 3       |                | BUSINESS RESEARCH                                   | 4      | 4          |
| 4       |                | ORGANIZATIONAL BEHAVIOUR                            | 4      | 4          |
| 5       |                | FINANCIAL REPORTING, STATEMENTS AND ANALYSIS        | 5      | 5          |
| 6       |                | BUSINESS STATISTICS & ANALYTICS FOR DECISION MAKING | 4      | 4          |
| 7       |                | LEGAL & BUSINESS ENVIRONMENT                        | 4      | 4          |
| 8       |                | MANAGERIAL SKILLS FOR EFFECTIVENESS                 | 4      | 4          |
|         |                |   | Total  | 33         |

### Subject Distribution

| <b>Sr. No.</b> | <b>Semester</b> | <b>Name of Subject /Practical</b>                      | <b>Name of Faculty</b>                     |
|----------------|-----------------|--|--|
| 1              | I               | MANAGERIAL ECONOMICS                                   | Prof. Ashima Varghese                      |
| 2              | I               | MANAGEMENT INFORMATION SYSTEM                          | Prof. Shweta Wasnik                        |
| 3              | I               | BUSINESS RESEARCH                                      | Dr. Jonathan Joseph / Prof. Pallavi Chaple |
| 4              | I               | ORGANIZATIONAL BEHAVIOUR                               | Dr. Pravin Bhise                           |
| 5              | I               | FINANCIAL REPORTING, STATEMENTS AND ANALYSIS           | Prof. Vinita Dighorikar                    |
| 6              | I               | BUSINESS STATISTICS & ANALYTICS FOR DECISION<br>MAKING | Dr. Jaspl Gidwani                          |
| 7              | I               | LEGAL & BUSINESS ENVIRONMENT                           | Prof. Rajendra Katole                      |
| 8              | I               | MANAGERIAL SKILLS FOR EFFECTIVENESS                    | Prof. Puja Nagpure / Prof Kunal Padole     |

### Faculty wise Load

| Sr. No. | Name of Faculty                               | Semester | Subject   | Theory | Total |
|---------|---|----------|---|--------|-------|
| 1       | Dr. Jonathan Joseph/<br>Prof. Pallavi Chapale | I        | BUSINESS RESEARCH                                   | 4      | 4     |
| 2       | Dr. Jaspal Gidwani                            | I        | BUSINESS STATISTICS & ANALYTICS FOR DECISION MAKING | 4      | 4     |
| 3       | Dr. Pravin Bhise                              | I        | ORGANIZATIONAL BEHAVIOUR                            | 4      | 4     |
| 4       | Prof. Rajendra Katole                         | I        | LEGAL & BUSINESS ENVIRONMENT                        | 4      | 4     |
| 5       | Prof. Vinita Dighorikar                       | I        | LEGAL & BUSINESS ENVIRONMENT                        | 5      | 5     |
| 6       | Prof. Ashima Varghese                         | I        | LEGAL & BUSINESS ENVIRONMENT                        | 4      | 4     |
| 7       | Prof. Shweta Wasnik                           | I        | MANAGEMENT INFORMATION SYSTEM                       | 4      | 4     |
| 8       | Prof. Puja Nagpure/<br>Prof. Kunal Padole     | I        | MANAGERIAL SKILLS FOR EFFECTIVENESS                 | 4      | 4     |

## **DEPARTMENT OF MBA**

### **Second Semester**

#### Teaching Load Calculation

| Sr. No. | Subject  | Theory | Total Load |
|---------|--|--------|------------|
| 1       | FINANCIAL MANAGEMENT                               | 5      | 5          |
| 2       | MARKETING MANAGEMENT                               | 5      | 5          |
| 3       | HUMAN RESOURCE MANAGEMENT                          | 5      | 5          |
| 4       | OPERATIONS MANAGEMENT                              | 5      | 5          |
| 5       | INTERNATIONAL BUSINESS                             | 5      | 5          |
| 6       | CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABILITY | 5      | 5          |
| 7       | COST ACCOUNTING                                    | 5      | 5          |
|         |  | Total  | 35         |

### Subject Distribution

| <b>Sr. No.</b> | <b>Semester</b> | <b>Name of Subject /Practical</b>                  | <b>Name of Faculty</b>                    |
|----------------|-----------------|--|---|
| 1              | I               | FINANCIAL MANAGEMENT                               | Prof. Vinita Dighorikar                   |
| 2              | I               | MARKETING MANAGEMENT                               | Prof. Ashima Varghese                     |
| 3              | I               | HUMAN RESOURCE MANAGEMENT                          | Prof. Rajendra Katole                     |
| 4              | I               | OPERATIONS MANAGEMENT                              | Prof. Shweta Wasnik                       |
| 5              | I               | INTERNATIONAL BUSINESS                             | Dr. Jonathan Joseph / Prof Pallavi Chaple |
| 6              | I               | CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABILITY | Prof Puja Nagpure / Prof. Kunal Padole    |
| 7              | I               | COST ACCOUNTING                                    | Dr. Jaspal Gidwani                        |

### Faculty wise Load

| <b>Sr. No.</b> | <b>Name of Faculty</b>                    | <b>Subject</b>                                     | <b>Theory</b> | <b>Total</b> |
|----------------|---|--|---------------|--------------|
| 1              | Prof. Vinita Dighorikar                   | FINANCIAL MANAGEMENT                               | 5             | 5            |
| 2              | Prof. Ashima Varghese                     | MARKETING MANAGEMENT                               | 5             | 5            |
| 3              | Prof. Rajendra Katole                     | HUMAN RESOURCE MANAGEMENT                          | 5             | 5            |
| 4              | Prof. Shweta Wasnik                       | OPERATIONS MANAGEMENT                              | 5             | 5            |
| 5              | Dr. Jonathan Joseph / Prof Pallavi Chaple | INTERNATIONAL BUSINESS                             | 5             | 5            |
| 6              | Prof Puja Nagpure / Prof. Kunal Padole    | CORPORATE SOCIAL RESPONSIBILITY AND SUSTAINABILITY | 5             | 5            |
| 7              | Dr. Jaspal Gidwani                        | COST ACCOUNTING                                    | 5             | 5            |



**DEPARTMENT OF MBA** - **Third Semester**

**Teaching Load Calculation**

| Sr. No. | Subject  | Theory | Total Load |
|---------|--|--------|------------|
| 1       | STRATEGIC MANAGEMENT   | 1      | 1          |
| 2       | SUMMER INTERNSHIP PROJECT                                    | 1      | 1          |
| 3       | MM1: SALES AND DISTRIBUTION MANAGEMENT                       | 3      | 3          |
| 4       | MM2: DIGITAL AND SOCIAL MEDIA MARKETING                      | 3      | 3          |
| 5       | MM3: INTEGRATED MARKETING COMMUNICATION AND BRAND MANAGEMENT | 3      | 3          |
| 6       | FM1: INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT              | 3      | 3          |
| 7       | FM2: PROJECT APPRAISAL AND FINANCE                           | 3      | 3          |
| 8       | FM3: FINANCIAL DERIVATIVES                                   | 3      | 3          |
| 9       | HRM1: MANPOWER PLANNING, RECRUITMENT AND SELECTION           | 3      | 3          |
| 10      | HRM2: PERFORMANCE MEASUREMENT SYSTEM                         | 3      | 3          |
| 11      | HRM3: COMPENSATION AND BENEFITS MANAGEMENT                   | 3      | 3          |
| 12      | OM1: LOGISTICS AND SUPPLY CHAIN MANAGEMENT                   | 3      | 3          |
| 13      | OM2: QUALITY TOOLKIT FOR MANAGERS                            | 3      | 3          |
| 14      | OM3: OPERATIONS RESEARCH                                     | 3      | 3          |
|         |  | Total  | 38         |

### Subject Distribution

| Sr. No. | Name of Subject /Practical                                   | Name of Faculty         |
|---------|--|-------------------------|
| 1       | STRATEGIC MANAGEMENT   | Prof. Rajendra Katole   |
| 2       | SUMMER INTERNSHIP PROJECT                                    | Prof. Shweta Wasnik     |
| 3       | MM1: SALES AND DISTRIBUTION MANAGEMENT                       | Dr. Pravin Bhise        |
| 4       | MM2: DIGITAL AND SOCIAL MEDIA MARKETING                      | Prof. Pallavi Chapale   |
| 5       | MM3: INTEGRATED MARKETING COMMUNICATION AND BRAND MANAGEMENT | Prof. Ashima Varghese   |
| 6       | FM1: INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT              | Dr. Jaspal Gidwani      |
| 7       | FM2: PROJECT APPRAISAL AND FINANCE                           | Dr. Jaspal Gidwani      |
| 8       | FM3: FINANCIAL DERIVATIVES                                   | Prof. Vinita Dighorikar |
| 9       | HRM1: MANPOWER PLANNING, RECRUITMENT AND SELECTION           | Dr. Jonathan Joseph     |
| 10      | HRM2: PERFORMANCE MEASUREMENT SYSTEM                         | Prof. Rajendra Katole   |
| 11      | HRM3: COMPENSATION AND BENEFITS MANAGEMENT                   | Prof Kunal Padole       |
| 12      | OM1: LOGISTICS AND SUPPLY CHAIN MANAGEMENT                   | Prof. Shweta Wasnik     |
| 13      | OM2: QUALITY TOOLKIT FOR MANAGERS                            | Prof. Puja Nagpure      |
| 14      | OM3: OPERATIONS RESEARCH                                     | Prof. Vinita Dighorikar |

### Faculty wise Load

| Sr. No. | Name of Faculty         | Subject  | Theory | Total |
|---------|-------------------------|--|--------|-------|
| 1       | Prof. Rajendra Katole   | STRATEGIC MANAGEMENT   | 1      | 4     |
|         |                         | HRM2: PERFORMANCE MEASUREMENT SYSTEM                         | 3      |       |
| 2       | Dr. Pravin Bhise        | MM1: SALES AND DISTRIBUTION MANAGEMENT                       | 3      | 6     |
| 3       | Prof. Pallavi Chapale   | MM2: DIGITAL AND SOCIAL MEDIA MARKETING                      | 3      | 3     |
| 4       | Dr. Jaspal Gidwani      | FM1: INVESTMENT ANALYSIS & PORTFOLIO MANAGEMENT              | 3      | 6     |
|         |                         | FM2: PROJECT APPRAISAL AND FINANCE                           | 3      |       |
| 5       | Prof. Vinita Dighorikar | FM3: FINANCIAL DERIVATIVES                                   | 3      | 6     |
|         |                         | OM3: OPERATIONS RESEARCH                                     | 3      |       |
| 6       | Dr. Jonathan Joseph     | HRM1: MANPOWER PLANNING, RECRUITMENT AND SELECTION           | 3      | 3     |
| 7       | Prof Kunal Padole       | HRM3: COMPENSATION AND BENEFITS MANAGEMENT                   | 3      | 3     |
| 8       | Prof. Shweta Wasnik     | OM1: LOGISTICS AND SUPPLY CHAIN MANAGEMENT                   | 3      | 4     |
|         |                         | SUMMER INTERNSHIP PROJECT                                    | 1      |       |
| 9       | Prof. Ashima Varghese   | MM3: INTEGRATED MARKETING COMMUNICATION AND BRAND MANAGEMENT | 3      | 3     |
| 10      | Prof. Puja Nagpure      | OM2: QUALITY TOOLKIT FOR MANAGERS                            | 3      | 3     |

**DEPARTMENT OF MBA** - **Fourth Semester**

**Teaching Load Calculation**

| Sr. No. | Subject   | Theory | Total Load |
|---------|---|--------|------------|
| 1       | MM4: RETAIL SALES MANAGEMENT AND SERVICES MARKETING | 4      | 3          |
| 2       | FM4: MANAGING BANKS AND FINANCIAL INSTITUTIONS      | 4      | 1          |
| 3       | HRM4: TEAM DYNAMICS                                 | 4      | 3          |
| 4       | OM4: SALES AND OPERATIONS PLANNING                  | 4      | 3          |
| 5       | Open & Exit Seminar                                 | 4      | 3          |
| 6       | Project work and Viva Voice (As per Specialization) | 16     | 16         |
|         |   | Total  | 29         |

### Subject Distribution

| Sr. No. | Name of Subject /Practical                          | Name of Faculty         |
|---------|---|-------------------------|
| 1       | MM4: RETAIL SALES MANAGEMENT AND SERVICES MARKETING | Prof. Ashima Varghese   |
| 2       | FM4: MANAGING BANKS AND FINANCIAL INSTITUTIONS      | Prof. Vinita Dighorikar |
| 3       | HRM4: TEAM DYNAMICS                                 | Dr. Jonathan Joseph     |
| 4       | OM4: SALES AND OPERATIONS PLANNING                  | Prof. Puja Nagpure      |
| 5       | Open & Exit Seminar                                 | Prof. Kunal Padole      |
| 6       | Project work and Viva Voice(As per specialization)  |                         |
|         | Financial Management                                | Dr. Jaspal Gidwani      |
|         | Marketing Management                                | Dr. Pravin Bhise        |
|         | Human Resource Management                           | Prof. Rajendra Katole   |
|         | Operation Management                                | Prof. Shweta Wasnik     |

### Faculty wise Load

| <b>Sr. No.</b> | <b>Name of Faculty</b>  | <b>Subject</b>   | <b>Theory</b> | <b>Total</b> |
|----------------|-------------------------|--|---------------|--------------|
| 1              | Prof. Ashima Varghese   | MM4: RETAIL SALES MANAGEMENT AND SERVICES<br>MARKETING | 5             | 5            |
| 2              | Prof. Vinita Dighorikar | FM4: MANAGING BANKS AND FINANCIAL INSTITUTIONS         | 5             | 5            |
| 3              | Dr. Jonathan Joseph     | HRM4: TEAM DYNAMICS                                    | 5             | 5            |
| 4              | Prof. Puja Nagpure      | OM4: SALES AND OPERATIONS PLANNING                     | 5             | 5            |
| 5              | Prof. Kunal Padole      | Open & Exit Seminar                                    | 4             | 4            |
| 6              |                         | Project work and Viva Voice(As per specialization)     |               |              |
|                | Dr. Jaspal Gidwani      | Financial Managemet                                    | 4             | 4            |
|                | Dr. Pravin Bhise        | Marketing Management                                   | 4             | 4            |
|                | Prof Rajendra Katole    | Human Resource Management                              | 4             | 4            |
|                | Prof. Shweta Wasnik     | Operation Management                                   | 4             | 4            |



# Guru Nanak Institute of Engineering & Technology

Dahegaon, Kalmeshwar Road, Nagpur-441501



## Department of Applied Sciences & Humanities (B. Tech. First Year)

### SECOND SEMESTER

#### Master Time Table

2021-2022 (EVEN)

w.e.f. :- 09 /05/2022

| <b>Day</b> | <b>Time Section</b> | <b>09.00 am To 10.00 am</b> | <b>10.00 am To 11.00 am</b> | <b>11.00 am To 11.15 am</b> | <b>11.15 am To 12.15 pm</b> | <b>12.15 pm To 1.15 pm</b> | <b>1.15 pm To 2.00 pm</b> | <b>2.00 pm To 3.00 pm</b>                     | <b>3.00 pm To 4.00 pm</b>                     | <b>4.00 pm To 5.00pm</b> |
|------------|---------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|----------------------------|---------------------------|---|---|--------------------------|
| <b>MON</b> | A                   | AC (EM)                     | AEM(VK)                     |                             | M-II (SC)                   | BEE (SB)                   |                           | WP(KW)  | AC (EM)Practical (A1) / AEM(VK)Practical (A2) |                          |
|            | B                   | BEE(SB)                     | M-II (SC)                   |                             | AC (RH)                     | AEM (VK)                   |                           | EM (DB)                                       | BEE(SB)                                       |                          |
| <b>TUE</b> | A                   | CS(AK) Practical            |                             |                             | AC (EM)                     | AEM (VK)                   |                           | AEM(VK)Practical (A1) / AC (EM)Practical (A2) | BEE (SB)                                      |                          |
|            | B                   | AC (RH)                     | AEM (VK)                    |                             | CS (CS)                     | BEE (SB)                   |                           | WP(KW)  | EM (DB)                                       |                          |
| <b>WED</b> | A                   | AC (EM)                     | M-II (SC)                   |                             | ICC (MA)                    | AEM (VK)                   |                           | EM(DB)  | WP(KW)  |                          |
|            | B                   | M-II (SC)                   | AC (RH)                     |                             | CS (AK)                     | ICC(MA)                    |                           | AEM(VK)Practical(B1) / AC (RH) Practical(B2)  | WP(KW)  |                          |
| <b>THU</b> | A                   | CS (AK)                     | M-II (SC)                   |                             | AC (EM)                     | ICC(MA)                    |                           | M-II (SC)(T)                                  | EM (DB)                                       |                          |
|            | B                   | M-II (SC)                   | AC (RH)                     |                             | AEM (VK)                    | AEM (VK)                   |                           | AC (RH) Practical(B2) / AEM(VK)Practical (B2) | M-II (SC) (T)                                 |                          |
| <b>FRI</b> | A                   | AC (EM)                     | CS(AK)                      |                             | M-II (SC)                   | AEM (VK)                   |                           | ICC (MA)                                      | EM (DB)                                       |                          |
|            | B                   | EM (DB)                     | AC (RH)                     |                             | CS(AK) Practical            |                            |                           | EM (DB)                                       | WP (KW)                                       |                          |

Time Table In-charge

HoD, GNIET

Vice-Principal, GNIET

Principal, GNIET.

| <b>Sr. No.</b> | <b>Name of Faculty</b> | <b>Name of Subject</b>               | <b>Abbreviation Used</b> | <b>Section</b>                   |
|----------------|------------------------|--------------------------------------|--------------------------|----------------------------------|
| 1              | Prof. Swapnil Charjan  | Mathematics-II (TH)                  | M-II(SC)                 | A, B                             |
| 2              | Dr. Vivek Korde        | Advance Engineering Material (TH+PR) | AEM(VK)                  | A, B In Batches : A1, A2, B1, B2 |
| 3              | Prof. Ekta Meshram     | Advanced Chemistry (TH+PR)           | AC(EK)                   | A, In Batches : A1, A2           |
| 4              | Prof. Roshani Halmare  | Advanced Chemistry (TH+PR)           | AC(RH)                   | B, In Batches : B1, B2           |
| 5              | Prof. Ayaz Khan        | Computational Skills (TH+PR)         | CS(AK)                   | In Batches : A1, A2, B1, B2      |
| 6              | Prof. Dilip Budhlani   | Engineering Mechanics (TH+PR)        | EM(DB)                   | In Batches : A1, A2, B1, B2      |
| 7              | Prof. Sanjivani Barde  | Basics of Electrical Engg. (TH)      | BEE(SB)                  | A, B                             |
| 8              | Prof. Kishor Wagh      | Workshop (PR)                        | WK(KW)                   | In Batches : A1, A2, B1, B2      |
| 9              | Prof. Maroti Alat      | Indian Culture and Constitution      | ICC (MA)                 | A, B                             |



**GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY  
DAHEGAON, KALMESHWAR ROAD, NAGPUR-441501**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING  
SESSION 2020-2021 EVEN SEMESTER**



w.e.f.

**MASTER TIME TABLE**

**TIMING**

| Day | Semester | 09.00AM – 10.00AM         | 10.00AM – 11.00AM | 11.00AM – 12.00PM | 01.00 PM- 2.00 PM | 2.00PM – 3.00PM | 03.00PM – 04.00PM | 03.00PM – 04.00PM              | 4.00PM – 5.00PM |
|-----|----------|---------------------------|-------------------|-------------------|-------------------|-----------------|-------------------|--------------------------------|-----------------|
| MON | IV       | DSPD                      | TOC               | CN                | Lunch Break       | DMGT            | DBMS              | DBMS                           | SP              |
|     | VI       | MINI PROJECT              |                   | CN                |                   | AI              | CN                | FE                             | SEPM            |
|     | VIII     | CCC                       | DOS               | ICS               |                   | PROJECT         | DF                | DOS LAB                        |                 |
| TUE | IV       | DMGT                      | TOC               | CN                | Lunch Break       | SP              | DSPD              | DSPD LAB(B1)/ DBMS LAB (B2)    |                 |
|     | VI       | CN LAB (B1) / DP LAB (B2) |                   | DP                |                   | SEPM            | FE                | AI                             | CN              |
|     | VIII     | CCC                       | DOS               | DF                |                   | ICS             | ICS               | ICS LAB                        |                 |
| WED | IV       | DBMS                      | TOC               | DSPD              | Lunch Break       | CN              | SP                | DBMS LAB B2 / CW-II LAB B3     |                 |
|     | VI       | AI                        | CN                | SEPM              |                   | DP              | FE                | CN                             | AI              |
|     | VIII     | ICS                       | DOS               | DF                |                   | CCC             | DF                | PROJECT & SEMINAR              |                 |
| THU | IV       | CN                        | TOC               | SP                | Lunch Break       | DSPD            | DMGT              | DSPD LAB (B1) / CW-II LAB (B3) |                 |
|     | VI       | CN LAB B2 / DP LAB B1     |                   | FE                |                   | DP              | DP                | TECHNICAL UPGRADATION          |                 |
|     | VIII     | DOS                       | DF                | ICS               |                   | DOS             | CCC               | PROJECT & SEMINAR              |                 |
| FRI | IV       | DBMS                      | TOC               | DSPD              | Lunch Break       | CN              | DMGT              | SP                             | DBMS            |
|     | VI       | SEPM                      | SEPM              | FE                |                   | DP              | AI                | LIBRARY                        |                 |
|     | VIII     | DF                        | ICS               | DOS               |                   | CCC             | CCC               | TECHNICAL UPGRADATION          |                 |

**Prof. Ayaz Khan  
I/C HOD, CSE**

# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY



## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### M-TECH (CSE) 2021-2022 II & VI SEMESTER-TIME TABLE

**SEM-II-ROOM NO. 302 , SEM-IV-ROOM NO 307**

| DAY | SEMESTER | 09:00<br>TO<br>10:00 | 10:00<br>TO<br>11:00 | 11:00<br>TO<br>12:00 | 12:00<br>TO<br>01:00     | 01:00<br>TO<br>02:00 | 02:00<br>TO<br>03:00           | 03:00<br>TO<br>04:00 |
|-----|----------|----------------------|----------------------|----------------------|--------------------------|----------------------|--------------------------------|----------------------|
| MON | II-SEM   | ACNS                 | AA                   | ADIP                 | len Solvi ng / Inter net | AMM                  | Computer System Lab- 305(AA)   |                      |
|     | IV-SEM   |                      | PROJECT_SEMINAR-     |                      |                          |                      | -----                          |                      |
| TUE | II-SEM   | ADIP                 | FC-I-RM              | AMM                  |                          | AA                   | Computer System Lab- 305(ADIP) |                      |
|     | IV-SEM   |                      | PROJECT_SEMINAR      |                      |                          |                      | -----                          |                      |
| WED | II-SEM   | ACNS                 | ADIP                 | FC-I-RM              |                          | AA                   | TECHNICAL SEMINAR              |                      |
|     | IV-SEM   |                      | PROJECT_SEMINAR      |                      |                          |                      | -----                          |                      |
| THR | II-SEM   | ADIP                 | ACNS                 | FC-I-RM              |                          | AMM                  | -----                          |                      |
|     | IV-SEM   |                      | PROJECT_SEMINAR      |                      |                          |                      | -----                          |                      |
| FRI | II-SEM   | AA                   | AMM                  | ACNS                 |                          | FC-I-RM              | TECHNICAL SEMINAR              |                      |

### TEACHING FACULTY-II & IV -SEMESTER

| SR.NO | CODE       | NAME OF SUBJECT                    | THEORY/PRACTICAL | ABBREVIATION | NAME OF FACULTY |
|-------|------------|------------------------------------|------------------|--------------|-----------------|
| 01    | PG-CSE1-01 | Advance in Algorithm               | THEORY           | AA           | Prof. K.Malpe   |
| 02    | PG-CSE1-02 | Advances Computer Network Security | THEORY           | AOSD         | Prof. V.kamble  |
| 03    | PG-CSE1-03 | Advance Digital Image Processing   | THEORY           | Data Science | Prof. K.Malpe   |
| 04    | PG-CSE1-04 | Elective-3- Adavnce in Multimedia  | THEORY           | AI & ESD     | Prof. V.Kamble  |

|    |            |  |           |              |                |
|----|------------|--|-----------|--------------|----------------|
| 05 | PG-CSE1-05 | Foundation Course-Research Methodology | THEORY    | ADM & BDA    | Prof. Y.Wankar |
| 06 | PG-CSE1-06 | Lab-3-AA                               | PRACTICAL | PRACICAL-I   | Prof. K.Malpe  |
| 07 | PG-CSE1-07 | Lab-4 ADIP                             | PRACTICAL | PRACTICAL-II | Prof. V.Kamble |
| 08 | PG-CSE1-08 | PROJECT                                | PRACTICAL | -----        | Prof. K.Malpe  |
| 09 | PG-CSE1-08 | PROJECT                                | PRACTICAL | -----        | Prof. V.Kamble |

**M-tech Co-ordinator**

**HOD CSE**

**Principal**



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY, NAGPUR

**DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION  
ENGINEERING MASTER TIME-TABLE  
Session 2021-22(EVEN)**

**IV/VI/VIII Sem**

**Lecture Hall: - Offline**

**W.e.f: 17/03/2022(Updated)**

| Class/Hour | 1           | 2           | 3           | 4          | 5         | 6         | 7                   | 8         |
|------------|-------------|-------------|-------------|------------|-----------|-----------|---------------------|-----------|
| Time       | 09:00-10:00 | 10:00-11:00 | 11:00-12:00 | 12:00-1:00 | 1:00-2:00 | 2:00-3:00 | 3:00-4:00           | 4:00-5:00 |
| MON        | IV          | ASD         | NM&PM       | ADC        | LUNC      | DSA(T)    | PDS(PR)             | ---       |
|            | VI          | DCom        | TSS(T)      | FE         |           | DSP       | DCOM (PR)           | ---       |
|            | VIII        | CVD         | CCN         | DIP        |           | MRE(T)    | Project             | CRT       |
| TUE        | IV          | UC & A      | ASD         | PPS        | H         | DSA       | ADC(T) Mini Project | ----      |
|            | VI          | DSP         | TSS         | CSE        |           | DCOM(T)   | Forum               | ----      |
|            | VIII        | WMC         | CCN         | CVD(T)     |           | MRE       | Forum               | CRT       |
| WED        | IV          | PPS         | UC & A      | NM&PM      |           | ASD(T)    | ADE(PR)             | ----      |
|            | VI          | CSE         | TSS         | DCom       |           | FE(T)     | DSP (PR)            | ----      |
|            | VIII        | CCN         | WMC         | CVD        |           | DIP(T)    | CCN (PR)            | CRT       |
| THU        | IV          | ASD         | ADC         | DSA        |           | NM&PM     | PPS(T) Library      | ----      |
|            | VI          | FE          | CSE         | TSS        |           | DSP(T)    | Sports Library      | ----      |
|            | VIII        | DIP         | CCN(T)      | WMC        |           | MRE       | Project             | CRT       |
| FRI        | IV          | NM&PM(T)    | PPS         | DSA        |           | ADC       | UC & A (PR)         | ----      |
|            | VI          | FE          | DSP         | DCOM       |           | CSE(T)    | EWP(PR)             | ----      |
|            | VIII        | WMC(T)      | CVD(T)      | MRE        |           | DIP       | MRE (PR)            | CRT       |

- T=Tutorial

**Prof. Kajal Dhawale**  
**Time-Table In-charge**

**Prof. Neha Chourasia**  
**HOD**

**Prof. R. Bhombe**  
**Vice-Principal**

**Dr. H. Hajare**  
**Principal**

**IV Sem****TEACHING FACULTY**

| Sr. No. | Code       | Name of Subject                                  | Theory/Practical | Abbreviation | Name of Faculty        |
|---------|------------|--|------------------|--------------|------------------------|
| 1.      | BEETC-401T | Micro-controller and Applications                | Theory           | UC & A       | Prof. Sushma Telrandha |
| 2.      | BEETC-402T | Analog and Digital Communication                 | Theory           | ADC          | Prof. Sandip Buradkar  |
| 3.      | BEETC-403T | Analog System Design                             | Theory           | ASD          | Prof. Kajal Dhawale    |
| 4.      | BEETC-404T | Data Structure & Algorithms                      | Theory           | DSA          | Prof. Shweta Ramteke   |
| 5.      | BEETC-405T | Programming for Problem Solving                  | Theory           | PPS          | Prof. Tejaswini Amate  |
| 6.      | BEETC-406T | Numerical Mathematics & Probability Using MATLAB | Theory           | NM&PM        | Prof. Yeshwant Deodhe  |
| 7.      | BEETC-401P | Microcontroller and Applications Lab             | Practical        | UC & A       | Prof. Yeshwant Deodhe  |
| 8.      | BEETC-402P | Analog & Digital Electronics Lab                 | Practical        | ADE          | Prof. Amar Banmare     |
| 9.      | BEETC-403P | Programming & Data Structure Lab                 | Practical        | PDS          | Prof. Shweta Ramteke   |

**VI Sem**

| Sr. No. | Code      | Name of Subject                     | Theory/Practical | Abbreviation | Name of Faculty         |
|---------|-----------|-------------------------------------|------------------|--------------|-------------------------|
| 1.      | BEETE601T | Telecommunication Switching Systems | Theory           | TSS          | Prof. Suvarna Talatule  |
| 2.      | BEETE602T | Digital Signal Processing           | Theory           | DSP          | Prof. Abhay Satmohankar |
| 3.      | BEETE603T | Control System Engineering          | Theory           | CSE          | Prof. Nayan Shambarkar  |
| 4.      | BEETE604T | Digital Communication               | Theory           | DCOM         | Prof. Kajal Dhawale     |
| 5.      | BEETE605T | Functional English                  | Theory           | FE           | Prof. Pooja Thakare     |
| 6.      | BEETE602P | Digital Signal Processing           | Practical        | DSP          | Prof. Abhay Satmohankar |
| 7.      | BEETE604P | Digital Communication               | Practical        | DCOM         | Prof. Deepak Deshpande  |
| 8.      | BEETE606P | Electronics Workshops Practice      | Practical        | EWP          | Prof. Sharon Bhatnagar  |

**VIII Sem**

| Sr. No. | Code      | Name of Subject                   | Theory/Practical | Abbreviation | Name of Faculty  |
|---------|-----------|-----------------------------------|------------------|--------------|--|
| 1.      | BEETE801T | Microwave and Radar Engineering   | Theory           | MRE          | Prof. Harana Bodele  |
| 2.      | BEETE802T | Computer communication Network    | Theory           | CCN          | Prof. Nilesh Mohata  |
| 3.      | BEETE803T | Wireless and Mobile Communication | Theory           | WMC          | Prof. Deepak Deshpande   |
| 4.      | BEETE804T | Digital Image Processing          | Theory           | DIP          | Prof. Sharon Bhatnagar   |
| 5.      | BEETE805T | CMOS VLSI Design                  | Theory           | CMOS VLSI    | Prof. Amar Banmare   |
| 6.      | BEETE801P | Microwave and Radar Engineering   | Practical        | MRE          | Prof. Sushma Telrandha   |
| 7.      | BEETE802P | Computer communication Network    | Practical        | CCN          | Prof. Nayan Shambarkar   |
| 8.      | 8ET-6P    | Project                           | Practical        | Project      | Prof. S. Telrandha, Prof. A. Banmare, Prof. D. Deshpande, Prof. N. Shamabarkar, Prof. S. Bhatnagar, Prof. H. Bodele, Prof. S. Buradkar, Prof. N. Mohot |

**Prof. Kajal Dhawale**  
Time-Table In-charge

**Prof. Neha Chourasia**  
HOD

**Prof. R. Bhombe**  
Vice-Principal

**Dr. H. Hajare**  
Principal



**GURUNANAK INSTITUTE OF ENGINEERING & TECHNOLOGY, NAGPUR**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**  
**MASTER TIME-TABLE**  
**Session 2021-22(EVEN)**

W.E.F: 3/02/2022

CLASSES VIII -SEM LECTURE HALL B-208, VI SEM B-207, IV SEM SEC A B-207 , IV SEM B-106 SEC B

| Class Hour |          | 1                | 2                | 3                | BREAK           | 4              | 5               | 6  | 7               |
|------------|----------|------------------|------------------|------------------|-----------------|----------------|-----------------|--|-----------------|
| Ti me      |          | 9.00AM – 10.00AM | 10.00AM- 11.00AM | 11.00AM- 12.00PM | 12.00PM -1.00PM | 1.00PM- 2.00PM | 2.00PM – 3.00PM | 3.00 PM - 4.00PM                         | 4.00PM - 5.00PM |
| MON        | IV Sec A | PS               | S&S              | DELEC            | BREAK           | EMF            | SPT             | DELEC lab (B1)/ EMC-1 Lab(B2)/ SPT (B3)  |                 |
|            | IV Sec B | SPT              | EMF              | PS               |                 | DELEC          | S&S             | CS-I(B1) / PE(B2) /IVRW(B3)              |                 |
|            | VI       | PSP              | EDTC             | CS-I             |                 | PE (T)         | FE              | EHV AC HVDC                              |                 |
|            | VIII     | SGP              | CAPS(T)          | EDS              |                 | LIB            | LIB             | SGP(B1) / CAPS(B2) / PROJECT(B3)         |                 |
| TUE        | IV Sec A | S&S              | EMC-1            | SPT              | BREAK           | PS             | LIB             | DELEC lab (B2)/ EMC-1Lab(B3)/ SPT (B1)   |                 |
|            | IV Sec B | PS               | SPT              | S&S              |                 | EMC-1          | LIB             | CS-I(B2) / PE(B3) /IVRW(B1)              |                 |
|            | VI       | EEIM             | EEIM             | CS-I             |                 | PSP (T)        | EDTC            | SGP                                      |                 |
|            | VIII     | CAPS             | EHV AC HVDC      | EDS              |                 | LIB            | LIB             | SGP(B2) / CAPS(B3) / PROJECT(B1)         |                 |
| WED        | IV Sec A | DELEC            | EMF              | EMC-1            | BREAK           | PS             | LIB             | DELEC lab (B3)/ EMC-Lab(B1)/ SPT Lab(B2) |                 |
|            | IV Sec B | PS               | EMC-1            | DELEC            |                 | EMF            | LIB             | CS-I(B3) / PE(B1) /IVRW(B2)              |                 |
|            | VI       | EDTC             | CS-I(T)          | FE               |                 | PE             | LIB             | SGP(T)                                   |                 |
|            | VIII     | EHV AC HVDC      | CAPS             | EDS              |                 | LIB            | LIB             | SGP(B3) / CAPS(B1) / PROJECT(B2)         |                 |
| THU        | IV Sec A | EMC-1            | DELEC            | S&S              | BREAK           | EMF            | LIB             | Mini project                             |                 |
|            | IV Sec B | EMF              | S&S              | DELEC            |                 | EMC-1          | LIB             |  |                 |

|     | VI       | CS-I           | EDTC   | FE     |  | PE                    | PSP    | EEIM (T)     | SPORTS |
|-----|----------|----------------|--------|--------|--|-----------------------|--------|--------------|--------|
|     | VIII     | EHV AC<br>HVDC | SGP    | CAPS   |  | EDS                   | SPORTS | PROJECT      |        |
| FRI | IV Sec A | SPT            | EMF(T) | S&S(T) |  | LIB                   | SPORTS | Mini project |        |
|     | IV Sec B | S&S(T)         | SPT    | EMF(T) |  | LIB                   | SPORTS |              |        |
|     | VI       | PE             | EEIM   | PSP    |  | EDTC (T)              | CS-I   | FE           | SPORTS |
|     | VIII     | CAPS           | SGP    | EDS    |  | EHV AC<br>HVDC<br>(T) | SPORTS | PROJECT      |        |

\* T – Tutorial

Prof. Diksha Khare

Time Table – Incharge

Prof. Rajendra Bhombe

HOD,EE

Prof. Rajendra Bhombe

Vice-Principal

Dr. Hemant Hajare

Principal

**TEACHING FACULTY**

| Sem.     | Sr. No. | Subject Code | Name of Subject                               | Theory/ Practical | Abbreviation | Teaching Faculty                          |
|----------|---------|--------------|---|-------------------|--------------|---|
| IV Sec A | 1       | BEEE401T     | Signal & Systems                              | Theory            | S&S          | Prof.Meher Lalwani                        |
|          | 2       | BEEE402T     | Digital Electronics                           | Theory            | DELEC        | Prof.Akansha Dhone                        |
|          | 3       | BEEE403T     | Electrical machines-I                         | Theory            | EMC-1        | Prof.Akshay Pillewan                      |
|          | 4       | BEEE404T     | Power System                                  | Theory            | PS           | Prof. Ankita Bhimgade                     |
|          | 5       | BEEE405T     | Electromagnetic Fields                        | Theory            | EMF          | Prof.Yogesh Likhari                       |
|          | 6       | BEEE406T     | Simulation & Programming Techniques           | Theory            | SPT          | Prof.Buddeshwar Borkar                    |
|          | 7       | BEEE402P     | Digital Electronics lab                       | Practical         | DELEC        | Prof.Akansha Dhone                        |
|          | 8       | BEEE403P     | Electrical machines-I Lab                     | Practical         | EMC-1        | Prof.Akshay Pillewan Prof.Ankita Bhimgade |
|          | 9       | BEEE406P     | Simulation & ProgrammingTechniques Lab        | Practical         | SPT          | Prof.Shweta Ramteke                       |
| IV Sec B | 1       | BEEE401T     | Signal & Systems                              | Theory            | S&S          | Prof. Eshita Dupare                       |
|          | 2       | BEEE402T     | Digital Electronics                           | Theory            | DELEC        | Prof.Pradeep Barde                        |
|          | 3       | BEEE403T     | Electrical machines-I                         | Theory            | EMC-1        | Prof.Kavita Patil                         |
|          | 4       | BEEE404T     | Power System                                  | Theory            | PS           | Prof. Kanchan Bande                       |
|          | 5       | BEEE405T     | Electromagnetic Fields                        | Theory            | EMF          | Prof.Saraswati Mishra                     |
|          | 6       | BEEE406T     | Simulation & Programming Techniques           | Theory            | SPT          | Prof.Sneha Masarkar                       |
|          | 7       | BEEE402P     | Digital Electronics lab                       | Practical         | DELEC        | Prof.Pradeep Barde                        |
|          | 8       | BEEE403P     | Electrical machines-I Lab                     | Practical         | EMC-1        | Prof.Yogesh Gajbhiye Prof.Sneha Masarkar  |
|          | 9       | BEEE406P     | Simulation & ProgrammingTechniques Lab        | Practical         | SPT          | Prof. Sneha Masarkar                      |
| VI       | 1       | BEELE601T    | Power Station Practice                        | Theory            | PSP          | Prof.Milind Rode                          |
|          | 2       | BEELE602T    | Engineering Economics & Industrial Management | Theory            | EEIM         | Prof.Shweta Wasnik                        |
|          | 3       | BEELE603T    | Electrical Drives & Their Control             | Theory            | ED&TC        | Prof. Akshay Pillewan                     |
|          | 4       | BEELE604T    | Power Electronics                             | Theory            | PE           | Prof. Pallavi Barekar                     |
|          | 5       | BEELE605T    | Control System – I                            | Theory            | CS-I         | Prof. Yogesh Likhari                      |
|          | 6       | BEELE604P    | Power Electronics Lab                         | Practical         | PE           | Prof. Pallavi Barekar/Prof.Syeda Saba     |
|          | 7       | BEELE605P    | Control System Lab                            | Practical         | CS-I         | Prof. Manish Agrawal/Prof.Rutuja Zade     |
|          | 8       | BEELE606P    | Industrial Visit & Report Writing Lab.        | Practical         | IV&RW        | Prof. Ankita Bhimgade                     |
|          | 9       | BEELE607T    | Functional English                            | Theory            | FE           | Prof. Pooja Nagpure                       |

|      |   |                  |                                       |           |               |                       |
|------|---|------------------|---------------------------------------|-----------|---------------|-----------------------|
|      | 1 | <i>BEELE801T</i> | EHV AC & HVDC Transmission            | Theory    | EHV AC & HVDC | Prof. Milind Rode     |
|      | 2 | <i>BEELE802T</i> | Electrical Distribution System        | Theory    | EDS           | Prof. Rajendra Bhombe |
|      | 3 | <i>BEELE803T</i> | Switchgear & Protection               | Theory    | SGP           | Prof. Diksha Khare    |
| VIII | 4 | <i>BEELE804T</i> | Computer Applications In Power System | Theory    | CAPS          | Prof. Manish Agrawal  |
|      | 5 | <i>BEELE803P</i> | Switchgear & Protection               | Practical | SGP           | Prof. Diksha Khare    |
|      | 6 | <i>BEELE804P</i> | Computer Applications In Power System | Practical | CAPS          | Prof. Manish Agrawal  |
|      | 7 | <i>BEELE805P</i> | Project                               | Practical | PROJECT       | ALL FACULTIES         |

**Prof. Diksha Khare**

Time Table – Incharge

**Prof. Rajendra Bhombe**

HOD,EE

**Prof. Rajendra Bhombe**

Vice-Principal

**Dr.Hemant Hajare**

Principal



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

## DEPARTMENT OF ELECTRICAL ENGINEERING

Session 2021-22 (ODD)

### I-SEMESTER M.Tech (CBCS) Power Electronics and Power System (PEPS)

#### TIME TABLE

W.E.F:- 06/12/2021

| CLASS HOUR | 1             | 2            | BREAK (1.00-2.00) | 4             | 5            |
|------------|---------------|--------------|-------------------|---------------|--------------|
| TIME       | 11.00 – 12.00 | 12.00 - 1.00 |                   | 2.00 - 3.00   | 3.00 - 4.00  |
| MONDAY     | PSM           | ELE-II (UEE) |                   | PSS PRACTICAL |              |
| TUESDAY    | ACT           | ELE-II (UEE) |                   | APE           | PSM          |
| WEDNESDAY  | PSM           | ELE-I (PSDC) |                   | APE PRACTICAL |              |
| THURSDAY   | APE           | ELE-I (PSDC) |                   | ACT           | PRESENTATION |
| FRIDAY     | APE           | ELE-II (UEE) |                   | ACT           | ELE-I (PSDC) |

#### TEACHING FACULTY

| SR. NO. | CODE       | NAME OF SUBJECT  | THEORY/ PRACTICAL | ABBREVIATION | NAME OF FACULTY      |
|---------|------------|--|-------------------|--------------|----------------------|
| 1       | PGPEPS101T | ADVANCED POWER ELECTRONICS                               | Theory            | APE          | Prof. Yogesh Likhar  |
| 2       | PGPEPS102T | POWER SYSTEM MODELING                                    | Theory            | PSM          | Prof. Hitesh Murkute |
| 3       | PGPEPS103T | ADVANCED CONTROL THEORY                                  | Theory            | ACT          | Prof. Diksha Khare   |
| 4       | PGPEPS104T | ELECTIVE-I (POWER SYSTEM DYNAMICS & CONTROLS)            | Theory            | PSDC         | Prof. Sneha Masarkar |
| 5       | PGOPEN105T | ELECTIVE-II (Open) UTILIZATION OF ELECTRICAL ENGINEERING | Theory            | UEE          | Prof. Hitesh Murkute |
| 6       | PGPEPS106T | ADVANCED POWER ELECTRONICS                               | Practical         | APE LAB      | Prof. Diksha Khare   |
| 7       | PGPEPS107T | POWER SYSTEM SIMULATION                                  | Practical         | PSS LAB      | Prof. Yogesh Likhar  |

Prof. Yogesh Likhar  
M.Tech Co-ordinator

Prof. R.M. Bhombe  
Head, EE

Prof. R.M. Bhombe  
Vice- Principal

Dr. Hemant Hajare  
Principal



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

## DEPARTMENT OF ELECTRICAL ENGINEERING

Session 2020-21 (EVEN)

II-SEMESTER M.Tech (CBCS) Power Electronics and Power System (PEPS)

### TIME TABLE

| CLASS HOUR | 1             | 2            | BREAK (1.00-2.00) | 4                  | 5             |
|------------|---------------|--------------|-------------------|--------------------|---------------|
| TIME       | 11.00 – 12.00 | 12.00 - 1.00 |                   | 2.00 - 3.00        | 3.00 - 4.00   |
| MONDAY     | ELE-III (EAM) | RM           |                   | P Q Lab            |               |
| TUESDAY    | AED (YL)      | RM           |                   | AED PRACTICAL (YL) |               |
| WEDNESDAY  | ELE-III (EAM) | H & F        |                   | PQ                 | ELE-III (EAM) |
| THURSDAY   | AED (YL)      | H & F        |                   | AED (YL)           | PQ            |
| FRIDAY     | PQ            | H & F        |                   | RM                 | ELE-III (EAM) |

### TEACHING FACULTY

| SR. NO. | CODE       | NAME OF SUBJECT                                    | THEORY/<br>PRACTICAL | ABBREVIATION  | NAME OF FACULTY                            |
|---------|------------|--|----------------------|---------------|--|
| 1       | PGPEPS201T | HVDC and FACTS                                     | Theory               | H & F         | Prof. Htesh Murkute                        |
| 2       | PGPEPS202T | Power Quality                                      | Theory               | PQ            | Prof. Sneha Masarkar                       |
| 3       | PGPEPS203T | Advanced Electrical Drives                         | Theory               | AED           | Prof. Yogesh Likhari                       |
| 4       | PGPEPS204T | Elective –III (Core) (Energy Audit and Management) | Theory               | ELE-III (EAM) | Prof. Diksha Khare                         |
| 5       | PGOPEN205T | Research Methodology                               | Theory               | RM            | Prof. Sneha Masarkar                       |
| 6       | PGPEPS206T | Power Quality Lab                                  | Practical            | PQ LAB        | Prof. Yogesh Likhari / Prof. Diksha Khare  |
| 7       | PGPEPS207T | Advanced Electrical Drives LAB                     | Practical            | AED LAB       | Prof. Htesh Murkute / Prof. Sneha Masarkar |

Likhari :

Prof. Yogesh Likhari  
M.Tech. Co-ordinator

Prof. R.M. Bhombe  
Head, EE

Prof. R.M. Bhombe  
In-charge Principal



# GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY

## DEPARTMENT OF ELECTRICAL ENGINEERING

Session 2021-22 (ODD)

III- SEMESTER M.Tech (CBCS) Power Electronics and Power System (PEPS)

### TIME TABLE

Room No.: B-205

W.E.F:- 01/10/2021

| CLASS HOUR | 1               | 2              | BREAK (1.00-2.00) | 4                        | 5           |
|------------|-----------------|----------------|-------------------|--------------------------|-------------|
| TIME       | 11.00 – 12.00   | 12.00 - 1.00   |                   | 2.00 - 3.00              | 3.00 - 4.00 |
| MONDAY     | ELE-IV (P & S)  | PPM            |                   | Project Seminar          |             |
| TUESDAY    | ELE-IV (P & S)  | PPM            |                   | Project Seminar          |             |
| WEDNESDAY  | ELE-IV (P & S)  | PPM            |                   | Project Seminar          |             |
| THURSDAY   | PPM             | ELE-IV (P & S) |                   | Library                  | Sports      |
| FRIDAY     | Project Seminar |                |                   | Extracurricular activity |             |

### TEACHING FACULTY

| SR. NO. | CODE        | NAME OF SUBJECT                 | THEORY/ PRACTICAL | ABBREVIATION | NAME OF FACULTY     |
|---------|-------------|---------------------------------|-------------------|--------------|---------------------|
| 1       | PGOPEN 301T | Elective –IV PLC AND SCADA      | Theory            | P & S        | Prof. Yogesh Likhar |
| 2       | PGFD 302T   | Project Planning and Management | Theory            | PPM          | Prof. Diksha Khare  |
| 3       | PGPEPS 303P | Project Seminar                 | Practical         | .....        | All Faculty members |

Prof. Yogesh Likhar  
M.Tech Co-ordinator

Prof. R.M. Bhombe  
Head, EE

Prof. R.M. Bhombe  
Vice- Principal

Dr. Hemant Hajare  
Principal



**GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY, NAGPUR**

**DEPARTMENT OF MANAGEMENT STUDIES**

**M.B.A SEMESTER- II & IV**

**Session 2021-22 (Even)**

**MASTER TIME TABLE**

| CLASS HOUR<br>TIME |    | 1<br>9.00-10:00 | 2<br>10:00 –<br>11:00 | 3<br>11:00<br>-12:00 | BREAK<br>12:00-1:00 | 4<br>1:00-2:00 | 5<br>2:00-3:00 | 6<br>3:00-4:00    | 7<br>4:00-5:00    |
|--------------------|----|-----------------|-----------------------|----------------------|---------------------|----------------|----------------|-------------------|-------------------|
| <b>MONDAY</b>      | II | HRM             | IB                    | CA                   |                     | MM             | FM             | OM                | CSR&S             |
|                    | IV | OM4             | IHRM                  | FM4                  |                     | MM4            | OM4            | PROJECT –<br>VIVA | EXIT -<br>SEMINAR |
| <b>TUESDAY</b>     | II | HRM             | IB                    | CA                   |                     | MM             | FM             | OM                | CSR&S             |
|                    | IV | IHRM            | HRM4                  | FM4                  |                     | MM4            | IHRM           | PROJECT –<br>VIVA | EXIT -<br>SEMINAR |
| <b>WEDNESDAY</b>   | II | HRM             | IB                    | CA                   |                     | MM             | FM             | OM                | CSR&S             |
|                    | IV | OM4             | HRM4                  | FM4                  |                     | MM4            | HRM4           | PROJECT –<br>VIVA | EXIT -<br>SEMINAR |
| <b>THURSDAY</b>    | II | HRM             | IB                    | CA                   |                     | MM             | FM             | OM                | CSR&S             |
|                    | IV | OM4             | HRM4                  | IHRM                 |                     | MM4            | FM 4           | PROJECT –<br>VIVA | EXIT -<br>SEMINAR |
| <b>FRIDAY</b>      | II | HRM             | IB                    | CA                   |                     | MM             | FM             | OM                | CSR&S             |
|                    | IV | OM4             | HRM4                  | FM4                  |                     | IHRM           | MM4            | HRM4              | EXIT -<br>SEMINAR |

Prof. Vinita Dighorikar

Dr. Jonathan Joseph

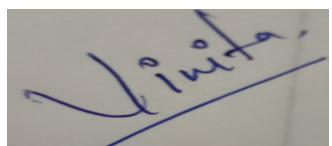
## TEACHING FACULTY

| Semester  | SN | Subject Code | Subject Name   | Theory/Practical | Abbreviation | Teaching Faculty   |
|-----------|----|--------------|--|------------------|--------------|--|
| <b>II</b> | 1. | <b>2T1</b>   | Financial Management                                 | Theory           | FM           | Prof. Vinita dighorikar  |
|           | 2. | <b>2T2</b>   | Marketing Management                                 | Theory           | MM           | Prof. Ashima Varghese  |
|           | 3. | <b>2T3</b>   | Human Resource Management                            | Theory           | HRM          | Prof. Rajendra Katole  |
|           | 4. | <b>2T4</b>   | Operations Management                                | Theory           | OM           | Prof. Shweta Wasnik  |
|           | 5. | <b>2T5</b>   | International Business                               | Theory           | IB           | Dr. Jonathan Joseph / Prof. Pallavi Chaple                                     |
|           | 6. | <b>2T6</b>   | CSR & Sustainability                                 | Theory           | CSR&S        | Prof. Puja Nagpure / Prof. Kunal Padole  |
|           | 7. | <b>2T7</b>   | Cost Accounting                                      | Theory           | CA           | Dr. Jaspal Gidwani   |
| <b>IV</b> | 1. | <b>4T1</b>   | TEAM DYNAMICS (HRM4)                                 | Theory           | TD           | Dr. Jonathan Joseph  |
|           | 2. | <b>4T1</b>   | SALES AND OPERATIONS PLANNING (OM4)                  | Theory           | S&OP         | Prof. Puja Nagpure   |
|           | 4. | <b>4T1</b>   | RETAIL SALES MANAGEMENT AND SERVICES MARKETING (MM4) | Theory           | RSM&SM       | Prof. Pallavi Chaple   |
|           | 5. | <b>4T1</b>   | MANAGING BANKS AND FINANCIAL INSTITUTIONS (FM4)      | Theory           | MB&FI        | Prof. Vinita dighorikar  |
|           | 8. | <b>4P5</b>   | PROJECT WORK AND VIVA VOCE                           | Theory           | PW&VV        | Mr. Rajendra Katole, Dr. Jaspal Gidwani, Dr. Pravin Bhise, Prof. Shweta Wasnik |
|           | 9. | <b>4S6</b>   | EXIT SEMINAR AND OPEN DEFENCE                        | Theory           | ES&OD        | Prof. Kunal Padole   |

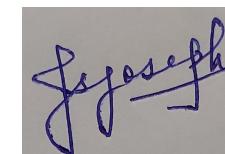
**GURU NANAK INSTITUTE OF ENGINEERING & TECHNOLOGY, NAGPUR**  
**DEPARTMENT OF MANAGEMENT STUDIES**  
**M.B.A SEMESTER- I & III**  
**Session 2021-22 (ODD)**

**MASTER TIME TABLE**

| CLASS HOUR<br>TIME |     | 1          | 2                | 3               | BREAK      | 4         | 5         | 6         | 7         |
|--------------------|-----|------------|------------------|-----------------|------------|-----------|-----------|-----------|-----------|
|                    |     | 9.00-10:00 | 10:00 –<br>11:00 | 11:00<br>-12:00 | 12:00-1:00 | 1:00-2:00 | 2:00-3:00 | 3:00-4:00 | 4:00-5:00 |
| <b>MONDAY</b>      | I   | BS         | MSE              | FRS& A          |            | L&BE      | OB        | ME        | MIS       |
|                    | III | FM1        | MM1              | HRM2            |            | OM2       | FM2       | HRM1      | OM1       |
| <b>TUESDAY</b>     | I   | BS         | BR               | FRS& A          |            | L&BE      | OB        | ME        | MIS       |
|                    | III | FM1        | MM1              | HRM2            |            | OM2       | FM2       | HRM3      | MM3       |
| <b>WEDNESDAY</b>   | I   | BS         | BR               | FRS& A          |            | L&BE      | OB        | ME        | MIS       |
|                    | III | FM1        | MM1              | OM2             |            | HRM2      | MM2       | OM3       | MM3       |
| <b>THURSDAY</b>    | I   | BS         | BR               | FRS& A          |            | MSE       | OB        | ME        | MIS       |
|                    | III | MM3        | HRM1             | OM1             |            | HRM3      | MM2       | OM3       | FM2       |
| <b>FRIDAY</b>      | I   | L&BE       | BR               | FRS& A          |            | L&BE      | MSE       | LIBRARY   | LIBRARY   |
|                    | III | SM         | HRM1             | OM1             |            | FM3       | OM3       | HRM3      | SIP       |



Prof. Vinita Dighorikar  
Time Table In-charge, MBA Dept.



Dr. Jonathan Joseph  
HOD, MBA Dept.

## TEACHING FACULTY

| Semester | SN  | Subject Code | Subject Name  | Theory/Practical | Abbreviation | Teaching Faculty                           |
|----------|-----|--------------|---|------------------|--------------|--|
| I        | 1.  | 1T1          | Managerial Economics                                | Theory           | ME           | Prof. Ashima Varghese                      |
|          | 2.  | 1T2          | Management Information System                       | Theory           | MIS          | Prof. Shweta Wasnik                        |
|          | 3.  | 1T3          | Business Research                                   | Theory           | BR           | Dr. Jonathan Joseph / Prof. Pallavi Chaple |
|          | 4.  | 1T4          | Organizational Behavior                             | Theory           | OB           | Dr. Pravin Bhise                           |
|          | 5.  | 1T5          | Financial Reporting, Statement & Analysis           | Theory           | FRS& A       | Prof. Vinita Dighorikar                    |
|          | 6.  | 1T6          | Business Statistics & Analytics for Decision Making | Theory           | BS&ADM       | Dr. Jaspal Gidwani                         |
|          | 7.  | 1T7          | Legal & Business Environment                        | Theory           | L&BE         | Prof. Rajendra Katole                      |
|          | 8.  | 1T8          | Managerial Skill for Effectiveness                  | Theory           | MSE          | Prof. Puja Nagpure / Prof. Kunal Padole    |
| III      | 1.  | 3T8          | Strategic Management                                | Theory           | SM           | Prof. Rajendra Katole                      |
|          | 2.  | 3P1          | Summer Internship Project                           | Theory           | SIP          | Prof. Shweta Wasnik                        |
|          | 3.  | 3T1          | MM1 - Sales & Distribution Management               | Theory           | S&DM         | Dr. Pravin Bhise                           |
|          | 4.  | 3T2          | MM2 – Digital & Social Media Marketing              | Theory           | D&SM         | Prof. Pallavi Chaple                       |
|          | 5.  | 3T3          | MM3- IMC & Brand Management                         | Theory           | IMC&BM       | Prof. Ashima Varghese                      |
|          | 6.  | 3T1          | FM1: Investment Analysis & Portfolio Management     | Theory           | IA&PM        | Dr. Jaspal Gidwani                         |
|          | 7.  | 3T2          | FM2: Project Appraisal And Finance                  | Theory           | PA&F         | Dr. Jaspal Gidwani                         |
|          | 8.  | 3T3          | FM3: Financial Derivatives                          | Theory           | FD           | Prof. Vinita Dighorikar                    |
|          | 9.  | 3T1          | HRM1: Manpower Planning, Recruitment And Selection  | Theory           | MPR&S        | Prof. Rajendra Katole                      |
|          | 10. | 3T2          | HRM2: Performance Measurement System                | Theory           | PMS          | Dr. Jonathan Joseph                        |
|          | 11. | 3T3          | HRM3: Compensation And Benefits Management          | Theory           | C&BM         | Prof. Kunal Padole                         |
|          | 12. | 3T1          | OM1 : Logisticts & Supply Chain Mgt                 | Theory           | L&SCM        | Prof. Shweta Wasnik                        |
|          | 13. | 3T2          | OM2 : Quality Toolkit for Manager                   | Theory           | QTM          | Prof. Puja Nagpure                         |
|          | 14. | 3T3          | OM3 : Operations Reserach                           | Theory           | OR           | Prof. Vinita Dighorikar                    |