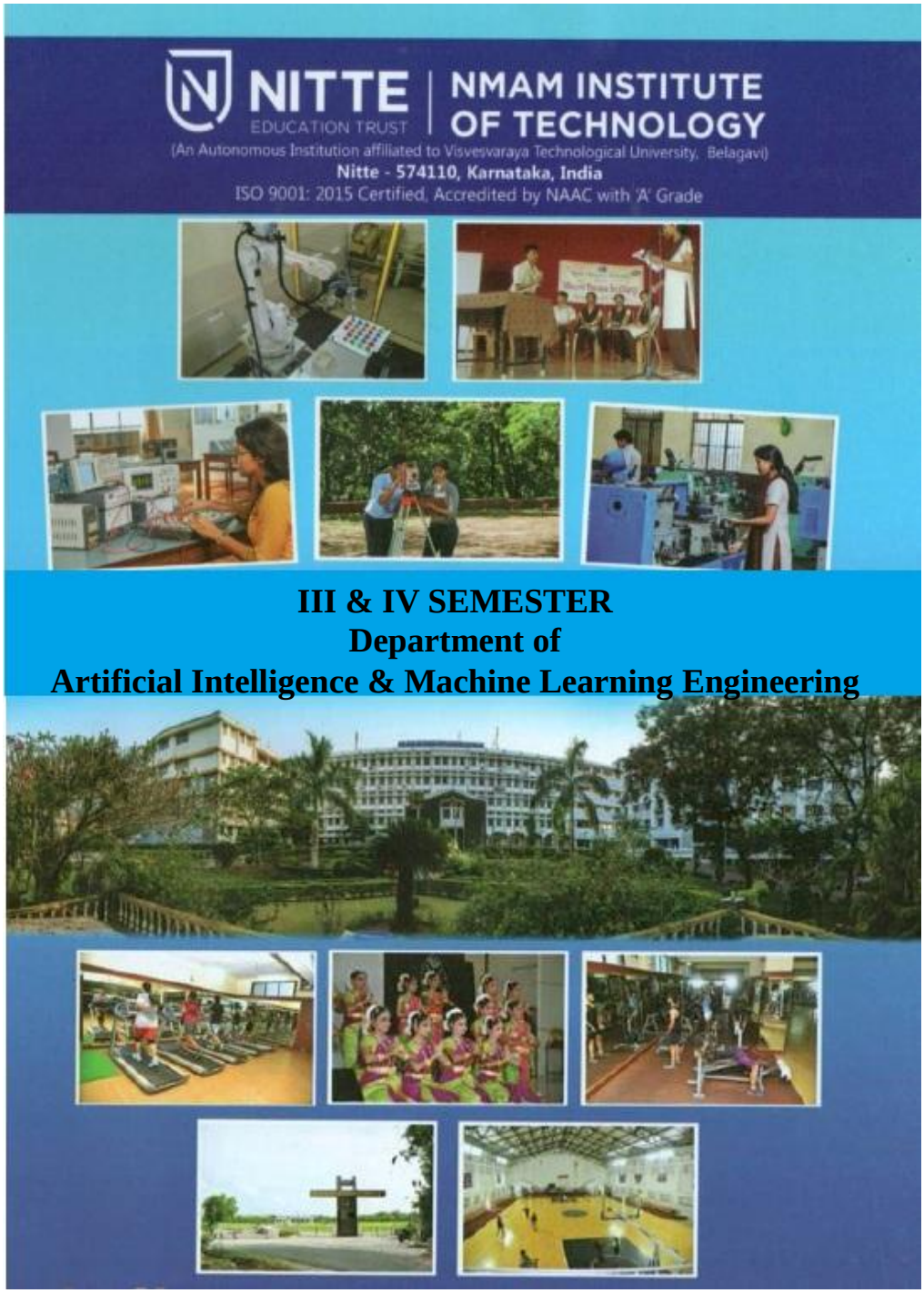
NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

College Calendar 2022-23

Department of Artificial Intelligence & Machine Learning Engineering

Syllabus of 2nd Year



College Calendar 2022-23

मातेव रक्षति पितेव हिते नियुङ्क्ते
कान्तेव चापि रमयत्यपनीय खेदम् ।
लक्ष्मीं तनोति वितनोति च दिक्षु कीर्तिं
किं किं न साधयति कल्पलतेव विद्या ॥

ಮಾತೇವ ರಕ್ಷತಿ ಪಿತೇವ ಹಿತೇ ನಿಯುಂಕ್ತೇ
ಕಾಂತೇವ ಚಾಪಿ ರಮಯತ್ಯಪನೀಯ ಖೇದಮ್ ।
ಲಕ್ಷ್ಮೀಂ ತನೋತಿ ವಿತನೋತಿ ಚ ದಿಕ್ಷು ಕೀರ್ತಿಂ
ಕಿಂ ಕಿಂ ನ ಸಾಧಯತಿ ಕಲ್ಪಲತೇವ ವಿದ್ಯಾ ॥

ತಾಯಿಯಂತೆ ರಕ್ಷಣೆಯನ್ನಿತ್ತು, ತಂದೆಯಂತೆ ಸನ್ಮಾರ್ಗದಲ್ಲಿ ತೊಡಗಿಸಿ ಪತ್ನಿಯಂತೆ ದುಃಖವನ್ನು ದೂರಮಾಡಿ ಮನಕ್ಕೆ ಮುದಕೊಡುತ್ತಾ, ಸಂಪತ್ತನ್ನು ವರ್ಧಿಸಿ ದಶದಿಕ್ಕುಗಳಲ್ಲಿ ಕೀರ್ತಿಯನ್ನು ಪಸರಿಸುವ 'ವಿದ್ಯೆ', ಕಲ್ಪಲತೆಯಂತೆ ನಾವು ಬಯಸಿದ್ದನ್ನು ಕೊಡುತ್ತಾಳೆ.

विद्या माता की तरह पालन करती है, बाप के तरह हितकर मार्ग में ही ले लेता है। पत्नी की तरह हमारा दुःख दूर करता है। मन को संतोष देता है, धन देती है, दिशाओं में कीर्ति फैलाती है। कल्पवल्ली की तरह वह सब कामनाये पूरी करती है।

Do you know in how many ways the 'Knowledge' serves his master? Like mother it protects, like father it teaches and guides, like wife, provides all kinds of happiness after destroying all sorrows, it brings wealth from every corner and spreads the fame in all direction. Like 'Kalpalatha' knowledge offers everything to human being whatever he wishes.

(An Autonomous Institution affiliated to VTU, Belgavi)
NITTE-574110, Karkala Taluk, Udupi District, Karnataka, India
ISO 9001:2015 Certified, Accredited by NAAC with "A" Grade

COLLEGE CALENDAR
2022-23
(III & IV Semester)

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

(An Autonomous Institution affiliated to VTU, Belgavi)
NITTE-574110, Karkala Taluk, Udupi District, Karnataka, India
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Vision Statement

Pursuing Excellence, Empowering people, Partnering in CommUNITy Development

Mission Statement

To develop N.M.A.M. Institute of Technology, Nitte, as Centre of Excellence by imparting Quality Education to generate competent,
Skilled and Humane Manpower to face emerging Scientific, Technological, Managerial and Social Challenges
with Credibility, Integrity, Ethics and Social Concern.

In Memorium

Late Nitte Mahalinga Adyanthaya

Our Founder

Late Justice K. S. Hegde

1909-1990

SRI N. VINAYA HEGDE

President, Nitte Education Trust
Chancellor, Nitte (Deemed to be University), Mangaluru

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

Sl.No.	Name of the Faculty	Designation
1.	Dr. Niranjan N. Chiplunkar	Principal
2.	Mr. Yogeesh Hegde	Director (CM&D)
3.	Dr. Shrinivasa Rao B. R.	Vice Principal / Controller of Examinations / Professor
4.	Dr. I. Ramesh Mithanthaya	Vice Principal / Dean (Academics) / Professor
5.	Dr. Sudesh Bekal	Dean (R&D)/Professor
6.	Dr. Srinath Shetty K.	Resident Engineer/Professor
7.	Dr. Rajesh Shetty K.	Dean (Admissions) / Professor
8.	Dr. Narasimha Bailkeri	Dean (Student Welfare) / Professor
9.	Dr. Rajalakshmi Samaga B L	PG Coordinator/Professor

HEADS OF DEPARTMENTS

1.	Dr. Arun Kumar Bhat	Civil Engg.
2.	Dr. Srinivas Pai P.	Mechanical Engg.
3.	Dr. Suryanarayana K.	Electrical & Electronics Engg.
4.	Dr. KV SSSS Sairam	Electronics & Communication Engg.
5.	Dr. Jyothi Shetty	Computer Science & Engg.
6.	Dr. Karthik Pai B. H.	Information Science & Engg.
7.	Dr. Sharada Uday Shenoy	Artificial Intelligence & Machine Learning
8.	Dr. Udaya Kumar Shenoy	Computer & Communication Engg.
9.	Dr. Muralidhara K.	Robotics & Artificial Intelligence Engg.
10.	Dr. Ujwal P.	Biotechnology Engg.
11.	Dr. Shobha R. Prabhu	Physics
12.	Dr. Shivaprasad Shetty M.	Chemistry
13.	Dr. Kumudakshi	Mathematics
14.	Mrs. Rashmi D. Hegde	Humanities
15.	Dr. Surendra Shetty	MCA
16.	Mr. Bharath G. Kumar	Head, Training & Placement Cell

INCHARGE OF INSTITUTION'S RESPONSIBILITIES

1.	Dr. Shashikanth Karinka	Coordinator MoUs
2.	Dr. Gururaj Upadhyaya	Workshop Supdt.
3.	Dr. Joy Elvine Martis	1st year Coordinator
4.	Dr. Venkatesh Kamath	Assistant CoE

5.	Dr. Janardhan Nayak	Coordinator, Red Cross UNIT
6.	Mr. Srinivas Nekkar	NCC Officer
7.	Mr. Krishnaraja Joisa	Public Relations Officer
8.	Dr. Jnaneshwar Pai Maroor	Co-ordinator, Alumni
9.	Sri. Shekar Poojari	Student Welfare Officer
10.	Mr. K. Sathish Nayak	Digital Media Executive

ENTREPRENEURSHIP DEVELOPMENT CELL

1.	Dr. Ramakrishna B.	Professor/EDC- Incharge
2.	Mrs. Geetha Poojarthi	Coordinator

DEPARTMENT OF TRAINING & PLACEMENT

1.	Mr. Ankith S. Kumar	Counsellor

DEPARTMENT OF MATHEMATICS

1.	Dr. Shashirekha B. Rai	Professor
2.	Dr. Kumudakshi	Asso. Professor/ HoD
3.	Dr. Sharad M. Hegde	Asst. Professor Gd III
4.	Dr. Vasanth K. R.	Asst. Professor Gd III
5.	Dr. Ashwini Kumari	Asst. Professor Gd III
6.	Mrs. Ambika N.	Asst. Professor Gd I
7.	Mrs. Vinaya Acharya	Asst. Professor Gd I
8.	Mrs. Anitha D. Bayar	Asst. Professor
9.	Mrs. Bhavya K.	Asst. Professor
10.	Ms. Chaithra K.	Asst. Professor
11.	Mrs. Bhavya. D.	Asst. Professor
12.	Mrs. Sharmila	Asst. Professor
13.	Mrs. Anjana Pai K.	Asst. Professor
14.	Mrs. Soumya	Asst. Professor
15.	Mrs. Smitha G. V.	Asst. Professor

DEPARTMENT OF PHYSICS

1.	Dr. K. B. Vijaya Kumar	Professor
2.	Dr. Sathyajith K. T.	Asso. Professor
3.	Dr. Manjunath K. B.	Asso. Professor
4.	Dr. Shobha R. Prabhu	Asso. Professor / HoD
5.	Dr. Nagaraja B. S.	Asst. Professor Gd III
6.	Dr. Raghavendra Bairy	Asst. Professor Gd III
7.	Dr. Shyam Prasad K.	Asst. Professor Gd III

DEPARTMENT OF CHEMISTRY

1.	Dr. Janardhana Nayak	Professor
2.	Dr. Ramesh Bhat	Asso. Professor
3.	Dr. Shivaprasad Shetty M.	Asso. Professor /HoD
4.	Dr. Aarti S. Bhat	Asst. Professor Gd III
5.	Dr. Subrahmanya Ishwar Bhat	Asst. Professor Gd III
6.	Dr. Sarvajith M. S.	Asst. Professor Gd III

DEPARTMENT OF HUMANITIES

1.	Dr. Ramakrishna B.	Professor
2.	Mrs. Rashmi D. Hegde	Asso. Professor/HoD
3.	Dr. Vishwanatha	Asso. Professor
4.	Dr. Jnaneshwar Pai Maroor	Asst. Professor Gd III
5.	Dr. Joy Elvine Martis	Asst. Professor Gd III
6.	Mrs. Shyla D. Mendonca	Asst. Professor Gd II
7.	Ms. Sonia Lobo	Asst. Professor Gd I
8.	Mr. Srinivas Nekkar	Asst. Professor
9.	Mrs. Sudeeksha S. Pai	Asst. Professor
10.	Mrs. Shwetha	Asst. Professor

OFFICE SECTION HEADS

1.	Mr. Keshava Mugeraya	Sr. Supdt., Academic Section/ Purchase In-Charge
2.	Mrs. Suneetha R. Shetty	Sr. Supdt., Administrative Section
3.	Mr. Suresh Achar	Sr. Supdt., Stores
4.	Mrs. Jayashree	Sr. Programmer, OAC
5.	Mrs. Shailaja V. Shetty	Supdt., Accounts Section
6.	Sri. Sudhakar K.	Incharge Librarian

SECURITY DEPARTMENT

1.	Mr. Hirianna Suvarna S.	Security Supervisor

SPORTS DEPARTMENT

1.	Sri. Shyam Sundar M.	P.E.D
2.	Sri. Ganesh Poojary	P.E.D
3.	Ms. Sowjanya M.	P.E.I
4.	Mr. Ravi Prakash C. Anpur	Basket Ball Coach

HOSTEL WARDENS

1.	Dr. Vishwanatha	Chief Warden, NET Gents Hostels, Nitte
2.	Dr. Veena Devi S.V	Chief Warden, NET Ladies Hostels, Nitte

HOSTEL SUPERINTENDENT / MANAGER

1.	Mr. John D'Souza	Sr. Manager, Gents Main Hostel
2.	Mr. Manjunatha Suvarna	Manager, Gents Main Hostel
3.	Mr. Rajesh Ballal	Manager, Gents PG Hostel
4.	Mrs. Gayathri Kamath	Manager, Ladies PG Hostel
5.	Mrs. Chethana Sharma	Manager, Ladies Main Hostel
6.	Mrs. Hema S. Hegde	Superintendent,, Hostel Office

REGULATIONS

2022-23

(Applicable for admission batch 2021-22 onwards)

NITTE EDUCATION TRUST | NMAM INSTITUTE OF TECHNOLOGY

CONTENTS

REGULATIONS

REGULATIONS COMMON TO ALL B.E. (CREDIT SYSTEM) DEGREE PROGRAMMES OF NMAM INSTITUTE OF TECHNOLOGY, NITTE Karkala, Udupi Dist., Karnataka

1. INTRODUCTION

1.1 The general regulations are common to all B.E. (Credit System) Degree Programmes conducted at the NMAMIT, Nitte Campus and shall be called “NMAMIT Regulations”.

1.2 The provisions contained in this set of regulations govern the policies and procedures on the Registration of students, imparting Instructions of course, conduct of the examination and evaluation and certification of student’s performance and all amendments related to the said Degree programme(s).

1.3 This set of Regulations, on approval by the Academic Council and Governing Council, shall supersede all the corresponding earlier sets of regulations of the BE Degree program (of VTU) along with all the amendments thereto, and shall be binding on all students undergoing the Graduate Degree Programme(s) (Credit System) conducted at the NMAMIT, Nitte with effect from its date of approval. **This set of Regulations, may evolve and get modified or changed through appropriate approvals from the Academic Council / Governing Council from time to time, and shall be binding on all stake holders (The Students, Faculty, Staff of Departments of NMAMIT, Nitte). The decision of the Academic Council/ Governing Council shall be final and binding.**

1.4 In order to guarantee fairness and justice to the parties concerned in view of the periodic evolutionary refinements, any specific issues or matters of concern shall be addressed separately, by the appropriate authorities, as and when found necessary.

1.5 The Academic Council may consider any issues or matters of Concern relating to any or all the academic activities of NMAMIT courses for appropriate action, irrespective of whether a reference is made here in this set of Regulations or otherwise.

1.6 The course shall be called **Bachelor of Engineering** course abbreviated as B.E. (Subject of specialization) – Credit System.

1.7 **DURATION OF THE COURSE**

(a) The course shall extend over a period of total duration of 4 years.

(b) Each year shall have the following schedule with **5** ½ days a week.
Suggested Break down of Academic Year into Semesters

1. No. of Semesters / Year	Three; Two being Main semesters (odd, even) and one being a supplementary semester; after 2 main semesters. (Note: Supplementary semester is primarily to assist weak and / or failed students through make up courses. However, Autonomous Colleges may use this semester to arrange Add-On courses for other students and / or for deputing them for practical training elsewhere.)
2. Semester Duration	Main semester (odd, even) each 19 Weeks; Supplementary Semester 8 Weeks
3. Academic Activities	Main Semester
(Weeks):	Registration of Courses & Course Work (16.0) Examination Preparation and Examination (3.0) Total (19) Supplementary Semester Registration of Courses & Course Work (5.0) Examination Preparation and Examination (3.0) Total (8) Declaration of results: 2 weeks from the date of last examination Inter- Semester Recess: After each Main Semester (2) Total Vacation: 10 weeks (for those who do not register for supplementary semester) and 4 weeks (for those who register for supplementary semester)

(Note: In each semester, there will be provision for students for Registration of courses at the beginning, dropping of courses in the middle and withdrawal from courses towards the end, under the advice of faculty member. These facilities are expected to enhance the learning capabilities of students, minimizing their chances of failure in courses registered and also ensure their better monitoring by Faculty Advisors).

A candidate shall be allowed a maximum duration of eight years from the first semester of admission to become eligible for the award of Bachelor Degree.

The calendar of events in respect of the course shall be fixed by the Senate from time to time, but preferably in line with the academic calendar of the VTU.

2. DEGREE PROGRAMMES

2.1 Undergraduate B.E. Degree Programmes are offered in the following disciplines by the respective programme hosting departments listed below:

i)	**Biotechnology Engineering**	**(BT)**
ii)	**Civil Engineering**	**(CV)**
iii)	**Computer Science & Engineering**	**(CS)**
iv)	**Electronics & Communications Engineering**	**(EC)**
v)	**Electrical & Electronics Engineering**	**(EE)**
vi)	**Information Science & Engineering**	**(IS)**
vii)	**Mechanical Engineering**	**(ME)**
viii)	**Artificial Intelligence and Machine Learning Engg.**	**(AM)**
ix)	**Computer and communication Engineering**	**(CC)**
x)	**Robotics and Artificial Intelligence Engineering**	**(RA)**

Other teaching departments are –

i)	**Mathematics**	**(MA)**
ii)	**Physics**	**(PH)**
iii)	**Chemistry**	**(CY)**
iv)	**Humanities, Social Sciences and Management**	**(HU)**

2.2 The provisions of these Regulations shall be applicable to any new discipline* that may be introduced from time to time and appended to the above list.

3. REGISTRATION

3.1 Every student after consulting his Faculty Advisor in parent department shall register approved courses (core and elective) to earn credits for meeting the requirements of degree program at the commencement of each Semester

on the days fixed for such registration and notified in the academic calendar. Students who fail to register on or before the specified date will have to pay a late fee. Such courses together with their grade and credits earned will be included in the grade card issued by the college at the end of each semester, like odd, even, supplementary and it forms the basis for determining the student's performance in that semester.

3.2 Lower and Upper Limits for Course Credits Registered in a Semester Course Credit Assignment

All courses comprise of specific Lecture/Tutorial/Practical (L-T-P) schedule. The course credits are fixed based on the following norms.

Lecture / Tutorials / Practical:

i) One hour Lecture per week is assigned one Credit.

ii) 2-hour Tutorial session per week is assigned 1.0 Credit.

iii) 2-hour Lab. session per week is assigned 1.0 credit.

For example, a theory course with L-T-P schedule of 3-2-0 hours will be assigned 4.0 credits.

A laboratory practical course with L-T-P schedule of 0-0-2 hours will be assigned 1.0 credit.

Calculation of Contact Hours / Week – A Typical Example

A student must register, as advised by Faculty Advisor, between a minimum of 15 credits and up to a Maximum of 25 credits.

3.3 Mandatory Pre-Registration for higher semester

In order to facilitate proper planning of the academic activities of the Semester, it is necessary for the students to declare their intention to register for courses of higher semesters (3rd and above) at least two weeks before the end of the current semester choosing the courses offered by each department in the next higher semester which is displayed on the Department Notice Board at least 4 weeks prior to the last working day of the semester.

Registration to a higher semester is allowed only if the student fulfills the following conditions -

i) satisfied all the academic requirements to continue with the programme of studies without termination

ii) cleared all Institute, hostel and library dues and fines, if any, of the previous semester

iii) paid all required advance payments of the Institute and the hostel for the current semester

iv) has not been debarred from registering on any specific grounds by the Institute.

4. ADD / DROP / AUDIT options

4.1 Registration of courses

Each student shall have to register for course work at the beginning of a semester within 2 to 3 days of commencement after discussing with subject teacher and under faculty advice. The permissible course load to be either average credits (=20) or to be within the limits of minimum (=15) and maximum (=25) credits.

4.2 DROP-option

During a specified period at the middle of a semester student's performance in CIE is reviewed by the faculty advisor. Following poor performance by a student he/she can be facilitated to drop identified course(s) (up to the minimum credits specified for the semester). Such course(s) will not be mentioned in the Grade card. Such courses to be re-registered by these students and taken up for study at a later time.

4.3 Withdrawal from courses

During a specific period specified towards the end of the semester, student's performance in CIE is reviewed by the Faculty advisors. Following poor performance by a student in identified course (s) he/she is advised to withdraw from such course(s) (up to the minimum credits specified for the semester) with mention in the Grade card (Grade 'W'). Such courses to be re-registered by these students and taken up for study at a later time.

4.4 AUDIT-option

A student can register for courses for audit only, with a view to supplement his/her knowledge and/or skills. The student's grades in such course(s) will have to be reflected in the grade card. However, CORE courses shall not be made available for audit. But these shall not be taken into account in determining the student's academic performance in the semester. 'U" grade is awarded to such courses on satisfying the attendance requirements and CIE requirements. The candidate need not appear for SEE in such courses.

5. COURSE STRUCTURE:

5.1 Typical Breakdown for the B.E. Degree Curriculum:

No.	Course Category	Credit Range
1.	Basic Science Courses	20-25
2.	Engineering Science Courses	18-22
3.	Humanity, Social Science and Management	8-12
4.	Ability Enhancement Courses	10-14

5.	Professional Core Courses (PCC)	40-45
6.	Professional Elective Courses (PEC)	8-12
7.	Open Elective Courses (OE)	8-12
8.	Skill Courses (Project Work / Internship / Seminar)	28-36
9.	Mandatory courses	2
Note: **Student can register between 15 to 25 credits per semester** **Total Credits to be earned : 160**		

5.2 The Department Undergraduate Committee (DUGC) will discuss and recommend the exact credits offered for the programme for the above components, the semester wise distribution among them, as well as the syllabi of all undergraduate courses offered by the department from time to time before sending the same to the Board of Studies(BOS). The BOS will consider the proposals from the departments and make recommendations to the senate for consideration and approval.

5.3 **The earned Credit Requirement for the B.E. Degree is 160**.

Degree is awarded by prescribing the total number of credits to be earned, rather than by using the program duration, giving flexibility to student to plan their career.

5.4 **Mandatory Learning Courses**

These are courses that must be completed by the student at appropriate time or at his convenience. The 'PP' grade is awarded for a Pass in the course and 'NP' grade is awarded for a Fail in the course. In case 'NP' grade is awarded, the student has to re- register for the same course wherein he has no alternative options. However, he/she can opt for other courses if he/she has been provided with multiple options.

The 'PP' and 'NP' grades do not carry grade points and hence not included in the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) computations. However such non-credit mandatory courses are required to be included in the students' performance record (transcript) with Pass or Fail (PP or NP).

Courses that come under this category are the following.

Moral and Ethical Values, Communication skills, Entrepreneurship Development Programme, Environmental issues, Proficiency in a Language etc.

Such courses will not carry any credits for the award of degree, but a pass

in each of such course during the programme shall be a necessary requirement for the student to qualify for degree award.

5.5 PROJECT

i) Project work at 7th semester shall be completed batch wise. The batch shall consist of a maximum of 4 students.

ii) Project viva-voce examination shall be conducted individually.

5.6 ELECTIVES

i) A candidate shall take electives in each semester from groups of electives, commencing from 6th semester.

ii) The minimum number of students to be registered for any Elective offered shall not be less than ten.

iii) A candidate shall opt for his/her choice of electives and register for the same if pre-registration is not done, at the beginning of each of 6th & 7th semesters. The candidate is permitted to opt for change of elective within 15 days from the date of commencement of the semester as per the academic calendar of the college.

6. ATTENDANCE REQUIREMENT:

6.1 Each semester is considered as a UNIT and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condoning 10% of the attendance by Principal for reasons such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation.

6.2 The basis for the calculation of the attendance shall be the period of term prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course (as per CET/COMED-K or Management allotment).

6.3 The students shall be informed about their attendance position in the first week of every month by the College so that the students shall be cautioned to make up the shortage.

6.4 A candidate having shortage of attendance (<75%) in any course(s) registered shall not be allowed to appear for SEE of such course(s).Such students will be awarded 'N' grade in these courses.

He/she shall have to repeat those course(s). Such students shall re-register for the same course(s) core or elective, as the case may be when the particular course is offered next either in a main (odd/even) or supplementary semester.

6.5 **Attendance in CIE and SEE:** Attendance at all examinations both CIE and SEE of each course registered shall be compulsory and there shall not be any provision for re-examinations. Any student against whom any disciplinary action is pending shall not be permitted to attend any SEE in that semester.

7. WITHDRAWAL FROM THE PROGRAMME

7.1 Temporary Withdrawal

a) A student who has been admitted to a degree programme of the college may be permitted once during the course to withdraw temporarily, for a period of one semester, on the grounds of prolonged illness or grave calamity in the family etc., provided –

i) The student applies to the College within 6 weeks of the commencement of the college stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian.

ii) The College is satisfied about the genuineness of the case and that even by taking into account the expected period of withdrawal, the student has the possibility to complete the programme requirements (160 credits) within the time limits specified by the university.

iii) The student does not have any dues or demands at the College / University including tuition and other fees as well as library material.

iv) A student availing of temporary withdrawal shall be required to pay such fees and/or charges as may be fixed by the college until such time as his/her name appears on the Student's roll list. The fees/charges once paid shall not be refunded.

v) A student will be entitled to avail the temporary withdrawal facility only once during his/her studentship. However, any other concession for the concerned student shall have to be approved by the academic council.

7.2 Permanent Withdrawal

Any student who withdraws admission before the closing date of admission for the Academic Session is eligible for the refund of the deposits only. Fees once paid will not be refunded on any account.

Once the admission for the year is closed, the following conditions govern withdrawal of admissions.

(a) A student who wants to leave the College for good, will be permitted to do so (and take Transfer Certificate from the College, if needed), only after remitting the Tuition fees as applicable for all the remaining semesters and clearing all other dues if any.

(b) Those students who have received any scholarship, stipend or other forms of assistance from the College shall repay all such amounts.

(c) The decision of the Principal of the College regarding withdrawal of a student is final and binding.

8. EVALUATION SYSTEM

8.1 The Academic Performance Evaluation of a student shall be according to a Letter Grading System, based on the Class Performance Distribution.

8.2 The Letter grades S, A, B, C, D, E, F indicate the level of academic achievement, assessed on a decimal (0-10) scale.

8.3 The Letter grade awarded to a student in a course, for which he has registered shall be based on his performance in quizzes, tutorials, assignments etc., as applicable, in addition to two mid- semester examinations and one semester end examination. The distribution of weightage among these components may be as follows.

Semester End Examination (SEE) : 50% (50 marks)

Continuous Internal Evaluation (CIE) : 50% (50 marks)

i) Quizzes, Tutorials, Assignments, Seminars, mini projects, tutorials etc. : 10 marks

ii) Mid-semester Examination : 40 marks

Any variation, other than the above distribution, requires the approval of the pertinent DUGC and Academic Council.

8.4 The letter grade awarded to a student in a 0-0-P (Practical) course, is based on an appropriate continuous evaluation scheme that the course instructor shall evolve, with the approval of the pertinent DUGC and the performance in SEE held on specified period in a semester.

8.5 The course Instructor shall announce in the class and/or display at the Faculty door/website the details of the Evaluation Scheme, including the distribution of the weightage for each of the components and method of conversion from the raw scores to the letter-grades within the first week of the semester in which the course is offered, so that there are no ambiguities in communicating the same to all the students concerned.

8.6 Passing standards

Evaluation Method	Passing Standard
Sessional (CIE)	Score: ≥40% (≥20 marks)
Terminal (SEE)	Score: ≥40% (≥20 marks)

i) Project work evaluation: The evaluation of CIE of the project work shall be based on the progress of the student in the work assigned by the project supervisor, periodically evaluated by him/her together with a Department committee constituted for this purpose. Seminar presentation, project report and final oral examination conducted by project evaluation committee at the department level shall form the SEE

of the project work.

ii) In the case of other requirements, such as, seminar, industrial internship, field work, comprehensive viva voce, if any, the assessment shall be made as laid down by the Academic council.

iii) **There shall be no re-examination for any course in the credit system.**

However, students

- who have abstained from attending CIE or SEE without valid reasons ('N' grade), or
- who have failed ('F' grade) to meet the minimum passing standards prescribed for CIE and/or SEE, or
- who have been detained for want of attendance, or
- who have withdrawn ('W' grade),
- who have dropped any course

shall be required to re-register for such course(s) and go through CIE and SEE again and obtain a grade equal to or better than E in each case. While such students should re-register for same course(s) if core, they can re-register for alternative course(s) from among the elective courses, as the case may be. The re- registration shall be possible when the particular course is offered again either in a main (Odd/Even) or a supplementary semester.

8.7

i) Grade point scale for absolute grading

Level	Out Standing	Excellent	Very Good	Good	Average	Poor	Fail
Grade	S	A	B	C	D	E	F
Grade Points	10	09	08	07	06	04	00
Score (Marks) Range(%)	≥ 90	< 90 - ≥80	< 80- ≥70	< 70- ≥60	< 60 - ≥50	< 50 - ≥40	< 40

ii) The grade points given above help in the evaluation of credit points earned by the student in a course as the credit points are equal to the number of credits assigned to the course multiplied by the grade points awarded to the student in that course. This shall be used in arriving at the credit index of the student for that semester, as it is the sum total of all the credit points earned by the student for all the courses registered in that semester.

8.8 Earning of Credits

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range S-E. Letter grade 'F' in any course implies failure of the student in that course and no credits earned.

8.9 The Transitional Grades 'I', 'W' and 'X' would be awarded by the teachers in the following cases. These would be converted into one or the other of the letter grades (S-F) after the student completes the course requirements.

- Grade 'I': To a student having satisfactory attendance at classes and meeting the passing standard at CIE, but remained absent from SEE for valid & convincing reasons acceptable to the College, like:

i) Illness or accident, which disabled him/her from attending SEE;
ii) A calamity in the family at the time of SEE, which required the student to be away from the College;

- Students who remain absent for Semester End Examinations due to valid reasons and those who are absent due to health reasons are required to submit the necessary documents along with their request to the Controller of Examinations to write Make up Examinations within 2 working days of that particular examination for which he or she is absent, failing which they will not be given permission. This is admissible only for students who have more than 45 CIE marks.
- Grade 'W': To a student having satisfactory attendance at classes, but withdrawing from that course before the prescribed date in a semester under Faculty Advice
- Grade 'X': To a student having attendance ≥85% and CIE rating (90%), in a course but SEE performance observed to be poor, which could result in a F grade in the course. **(No 'F' grade awarded in this case but student's performance record maintained separately).**

8.10 Grade Card

Each student shall be issued a Grade Card at the end of each semester. This will have a list of all the courses registered by a student in the semester, together with their credits, the letter grades with grade points awarded. Only those courses registered for credit and having grade points shall be included in the computation of the students performance like SGPA and CGPA and the courses taken for audit will not form part of this computation. The results of mandatory courses, which are of the non-credit type shall also be reflected in the Grade card as PP (for Passed) or NP (for not passed). **Each UG student shall have to obtain the grade PP in each mandatory course to qualify for the Degree awarded by the university.**

8.11 The Make Up Examination

The Make Up Examination facility would be available to students who may have missed to attend the SEE of one or more course(s) in a semester for valid reasons and given the 'I' grade; Also, students having the 'X' grade shall be eligible to take advantage of this facility. The makeup examination would be held as per dates notified in the Academic Calendar. However, it would be possible to hold a makeup examination at any other time in the semester with the permission of the Academic Council of the College. In all these cases, the standard of makeup examinations shall be same as the regular SEE for the course(s).

a) All the 'I' and 'X' grades awarded to the students would be converted to appropriate letter grades after the make-up examinations. Any outstanding 'I' and 'X' grades after the last scheduled make-up examinations shall be automatically converted to 'F' grade.

b) All the 'W' grades awarded to the students would be eligible for conversion to the appropriate letter grades only after the concerned students re-register for these courses in a main/ supplementary semester and fulfill the passing standards for their CIE and (CIE+SEE).

9. EVALUATION OF PERFORMANCE

The overall performance of a student will be indicated by two indices: SGPA; which is the Semester Grade Point Average, and CGPA which is the Cumulative Grade Point Average.

SGPA for a semester is computed as follows.

$$SGPA = \frac{\sum [\textit{(course credit) X (Grade point)}] \textit{ (for all courses in that semester)}}{\sum [\textit{(course credits)}]}$$

CGPA is computed as follows:

$$CGPA = \frac{\sum [\textit{(course credits)X (Grade points)}] \textit{ (for all courses excluding those with F grades until that semester)}}{\sum \textit{(course credits)}] \textit{ (for all courses excluding those with F grades until that semester)}}$$

10. COMMUNICATION OF GRADES

The SGPA and CGPA respectively, facilitate the declaration of academic performance of a student at the end of a semester and at the end of successive semesters. Both of them would be normally calculated to the second decimal position.

11. VERTICAL PROGRESSION (PROMOTION / ELIGIBILITY TO HIGHER SEMESTERS)

11.1 There shall be no restriction for promotion from an odd semester to the next even semester, provided the student has fulfilled the attendance requirement.

11.2 **A Student shall be declared fail if he / she**

(i) Has not satisfied the CIE requirements of any Course/s.

(ii) Has not registered for the SEE even after satisfying the attendance and CIE requirements.

11.3 **(A) Vertical Progression in case of students admitted to First year:**

(a) Students having not more than four F grades in the two semesters of first year of the Programme shall be eligible to move to second year.

(a.1) Students having not more than four F grades in the four semesters of I and II year shall be eligible to move to III year.

(a.2) Students who have earned all the prescribed credits of I year, and having not more than four grades in the four semesters of II and III year shall be eligible to move to IV year.

(B) Vertical Progression in case of Diploma students admitted to Second year (lateral entry):

(a) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II) in the two semesters of II year of the Programme shall be eligible to move to III Year.

(a.1) Students having not more than four F grades (excluding the Fail or pass status of Additional Mathematics I and II, if any) in the four semesters of II and III year shall be eligible to move to IV year.

(b) The mandatory non-credit Courses Additional Mathematics I and II prescribed at III and IV semesters respectively, to lateral entry Diploma holders admitted to III semester of B.E/B.Tech. Programmes shall attend the classes during the respective semesters to satisfy attendance and CIE requirements and to appear for the University examinations.

(b.1) In case, any student fails to satisfy the attendance requirement of the Courses Additional Mathematics I and II, he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.

(b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the Courses Additional Mathematics I and II shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.

(c) Completion of Additional Mathematics I and II shall be mandatory for the award of degree.

(C) Vertical Progression in case of B.Sc students admitted to Second year (Lateral entry):

(a) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme) in the two semesters of II year of the Programme shall be eligible to move to III year.

(a.1) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme, if any) in the four semesters of II and III year shall be eligible to move to IV year.

(b) The prescribed mandatory non-credit Courses Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme to lateral entry B. Sc holders admitted to III semester of B.E/B. Tech Programmes, shall attend the classes during the respective semesters to complete CIE and attendance requirements and to appear for the University examinations.

(b.1) In case, any student fails to satisfy the attendance requirement of the above said Courses; he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.

(b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the above said Courses, shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.

(c) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics shall be mandatory for the award of degree.

The Principal of each college shall make suitable arrangements in the timetable to facilitate the B. Sc students to attend the above mentioned courses to satisfy the CIE and attendance requirements and to appear for the University examinations.

11.4 Termination from the programme

A student shall be required to withdraw (discontinue) from the programme and leave the college on the following grounds.

i) **Failure to secure a CGPA = 5.0 on three consecutive occasions.**
ii) **Failure to earn a credit of 160 (120 for lateral entry students) in 8 years (6 years for lateral entry students) of duration from the year of admission including the duration of temporary withdrawal (leave of absence).**
iii) Absence from classes for more than **six weeks at a time** in a semester without leave of absence being granted by competent authorities.

iv) Failure to meet the standards of discipline as prescribed by the college from time to time.

12. AWARD OF CLASS

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class. This can be seen from the following Table.

Percentage Equivalence of Grade Points (For a 10-Point Scale)

Grade Point	Percentage of Marks	Class
≥ 7.75	≥ 70%	Distinction
≥ 6.75	≥ 60%	First Class
< 6.75	< 60%	Second Class

Percentage = (GPA - 0.75) x 10

13. APPEAL FOR REVIEW OF GRADES

a. The entire process of evaluation shall be made transparent and the course instructor shall explain to a student why he/she gets whatever grade he/she is awarded, if and when required. A mechanism for review of grade is incorporated in the evaluation system. However, before appealing for such review, a student shall first approach the concerned course Instructor and then the concerned DUGC, with the request to do the needful; and only in situations where satisfactory remedial measures have not been taken, the student may then appeal to the Department Academic Appeals Boards (DAAB) before the date specified in Academic Calendar, by paying the prescribed fees.

b. The fee for such an appeal will be decided by the Senate from time to time. If the appeal is upheld by DAAB, then the fee amount will be refunded to the student.

14. AWARD OF DEGREE

14.1 (1) B.E. Degree

a) Students shall be declared to have completed the Programme of B.E./B.Tech. degree and is eligible for the award of degree, provided the students have undergone the stipulated Course work of all the semesters under the Scheme of Teaching and Examinations and has earned the prescribed number of credits (160 credits for regular students registered for 4 year degree programmes & 120 for lateral entry students).

b) For the award of degree, a CGPA≥5.00 at the end of Programme shall be mandatory.

c) Completion of Additional Mathematics I and II, shall be mandatory for the award of degree to lateral entry diploma students.

d) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme shall be mandatory for the award of degree to lateral entry B.Sc. graduates.

e) (i) Over and above the academic credits, every Day College regular student admitted to the 4 years Degree Programme and every student entering 4 years Degree Programme through lateral entry, shall earn 100 and 75 Activity Points respectively through AICTE Activity Point Programme for the award of degree. Students transferred from other Universities/Autonomous colleges under VTU to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eight semester Grade Card.

(ii) Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points before the commencement of 8^{th} semester examinations, eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

(2) B.E. (Honors) Degree

VTU, Belagavi has framed the guidelines for applying for the award of Bachelor of Engineering (Honors) degree.

These Regulations are applicable for the following students:

1. Admitted to **I semester** / I year from the academic year **2018-19** (i.e. USN XXX18XXXXX)
2. Admitted to **III semester** / II year from the academic year **2019-20** (i.e. USN XXX19XX4XX)
3. These Regulations are uniformly applicable to Affiliated, Autonomous and Constituent Colleges under VTU.

Eligibility criterion

(i) Students have to earn 18 or more additional credits through MOOCs.

(ii) Students shall register for this course from fifth semester onwards.

(iii) Students shall obtain a grade $\geq$ D in all the courses in first attempt only in all the semesters till 5^{th}.

(iv) Students shall obtain CGPA of 8.5 and above at the end of fourth semester.

(v) For Diploma students, they shall complete Additional Mathematics I and II during 3rd and 4th semesters in first attempt only.

Requirements:

(i) Students shall maintain a grade ≥D in all courses from 5th to 8th semester in 'first attempt' only.

(ii) Students not having CGPA greater than or equal to 8.5 at the end of the B.E. programme shall not be eligible for the award of Honors degree, even if they have satisfied the requirement of additional credits.

(iii) Students shall take up additional course work, other than the regular courses prescribed by the University from 5th to 8th semester from NPTEL and other platforms notified by the University and complete the same in any number of attempts with a final score (online assignments: 25 % + Proctored examination: 75 %) leading to the following certificates – ELITE (60 to 75 %) or ELITE + SILVER (76 to 89 %) or ELITE + GOLD (≥ 90 %) before closure of eighth semester as per the academic calendar.

(iv) Students shall be permitted to drop the registered course work (s) and select alternative course work (s) in case they cannot give proctored examination.

(v) Students have to take courses from the list of MOOCs approved by the University, which can be from NPTEL / SWAYAM / other platforms.

(vi) Students shall select courses in consultation with their Class Advisor, such that the content / syllabus of them are not similar to that of the core courses, professional electives or open electives, which the students may chose in the program.

(vii) Students shall earn the additional credits for these courses through MOOCs, by only appearing in person to the proctored examinations conducted by NPTEL / SWAYAM / other platform. The method of assessment shall be as per NPTEL online platform.

(viii) The Credit equivalence shall be as follows - 4 weeks of online course duration – 1 credit, 8 weeks of online course duration – 2 credits and 12 weeks of online course duration – 3 credits.

Registration:

(i) Any student meeting the eligibility criteria and interested to register for Honors degree qualification shall apply to the University through the Principal in the prescribed form along with the prescribed application fees within 15 working days after notification by the University.

(ii) The Registrar shall notify the registration of the student and it will be notified to the student and the student shall pay a one-time, non-refundable registration fees as prescribed by the University to confirm the registration.

Award of Honors Qualification:

(i) Students who successfully complete the MOOCs prescribed by the University and submit their E-certificates to the University through the Principal against the notification issued by the Registrar in time before the closure of eighth semester, as per the academic calendar shall be eligible for B.E. (Honors) degree. If a student does not submit the certificates in time on or before the last date, their request shall not be considered, even if they have earned the requisite number of credits.

(ii) The Honors degree shall be awarded only if the CGPA at the end of the B.E. programme is equal to or greater than 8.5.

(iii) A student who has earned the requisite number of credits and who has submitted the certificates in time and has been accepted by the University will get B.E. degree with Honors suffixed indicating recognition of higher achievement by the student concerned.

(iv) Further students fulfilling all the above requirements shall be entitled to receive their transcripts indicating both the achievement of the student concerned.

(v) The award of the Honors degree shall be recommended by the Academic Senate and approved by the Executive Council of the University.

14.2 (1) Noncompliance of CGPA ≥ 5.00 at the end of the Programme

(a) Students, who have completed all the courses of the Programme but not having a CGPA ≥ 5.00 at the end of the Programme, shall not be eligible for the award of the degree.

(b) In the cases of 14.2 (1) a, students shall be permitted to appear again for SEE in course/s (other than Internship, Technical seminar, Project (Mini and Main), and Laboratories) of any Semester/s without the rejection of CIE marks for any number of times, subject to the provision of maximum duration of the Programme to make up the CGPA equal to or greater than 5.00 for the award of the Degree.

(c) In case, the students earn improved grade/s in all the reappeared course/s, the CGPA shall be calculated considering the improved grade/s. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA <5.00, the students shall follow the procedure laid in 14.2 (1) b

(d) In case, the students earn improved grade/s in some course/s and the same or lesser than the previously earned pass grade/s in the other reappeared course/s, the CGPA shall be calculated considering the improved grade/s and the pass grades earned before the reappearance. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA<5.00, the students shall follow the procedure laid in 14.2 (1) b

(e) In case, the students earn improved grade/s in some courses and fail in the other reappeared course/s, the CGPA shall be calculated by considering the

improved grade/s and the previously earned pass grade/s of the reappeared course/s in which the students have failed. If it is≥5.00, the students shall become eligible for the award of the degree. If CGPA <5.00, the students shall follow the procedure laid in 14.2 (1) b

(f) In case, the students fail (i.e., earns F grade) in all the reappeared course/s, pass grade/s of the course/s earned by the students before reappearance shall be retained. In such cases, the students shall follow the procedure laid in 14.2 (1) b

(g) Students shall obtain written permission from the Registrar (Evaluation) to reappear in SEE to make up the CGPA equal to or greater than 5.00.

(2) Noncompliance of Mini-project

(a) The mini-project shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the mini-project shall be declared fail in that course and shall have to complete the same during subsequent University examinations after satisfying the Mini-project requirements. Also, mini-project shall be considered for eligibility to VII semester.

(3) Noncompliance of Internship

(a) All the students of B.E/B.Tech shall have to undergo mandatory internship of 4 weeks during the vacation. A University examination shall be conducted during VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail in that Course and shall have to complete the same during subsequent University examinations after satisfy the internship requirements.

14.3 The maximum duration for a student for complying to the Degree requirements is 16 – semesters from the date of first registration for his first semester (8 years from the date of admission to first year, (12 semesters / 6 years from the date of admission for lateral entry student)).

15 GRADUATION REQUIREMENTS AND CONVOCATION

15.1 A student shall be declared to be eligible for the award of the degree if he/she has

a) **Fulfilled "Award of Degree" Requirements**
b) **No Dues to the College, Departments, Hostels, Library, Central Computer Centre and any other centres**
c) **No disciplinary action pending against him/her.**

15.2 **The award of the degree must be recommended by the Senate**

15.3 **Convocation**

Degree will be awarded for the students who have graduated during the preceding academic year. Students are required to apply for the Convocation along with the prescribed fees, after having satisfactorily completed all the degree requirements (refer 'Award of Degree') within the specified date in order to arrange for the award of the degree during convocation.

16 AWARD OF PRIZES, MEDALS, CLASS & RANKS

For the award of Prizes and Medals, the conditions stipulated by the Donor may be considered as per the statutes framed by the College for such awards.

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class as described in 12.

17 CONDUCT AND DISCIPLINE

17.1 Students shall conduct themselves within and outside the premises of the College in a manner befitting the students of an Institution of National Importance.

17.2 **As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.**

17.3 The following acts of omission/ or commission shall constitute gross violation of the Code of Conduct and are liable to invoke disciplinary measures:

a) Ragging.
b) Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.
c) Willful damage or stealthy removal of any property/belongings of the College/Hostel or of fellow students/citizens.
d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.
e) Mutilation or unauthorized possession of Library books.
f) Noisy and unseemly behaviour, disturbing studies of fellow students.

g) Hacking in computer systems (such as entering into other Person's area without prior permission, manipulation and/or Damage of computer hardware and software or any other Cyber crime etc.).

h) Plagiarism of any nature.

i) Any other act of gross indiscipline as decided by the Senate from time to time.

j) Use of Mobile in the college Academic area.

k) Smoking in College Campus and supari chewing.

l) Unauthorized fund raising and promoting sales.

Commensurate with the gravity of offence the punishment may be: reprimand, expulsion from the hostel, debarring from an examination, disallowing the use of certain facilities of the College, rustication for a specified period or even outright expulsion from the College, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

17.4 For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Dean (Academics), respectively, shall have the authority to reprimand or impose fine.

17.5 All cases involving punishment other than reprimand shall be reported to the Principal.

17.6 Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Controller of Examinations for taking appropriate action.

18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE

18.1 As per VTU guidelines, every students entering 4 year degree programme should earn 100 activity points & every students entering 4 year degree programme through Lateral Entry should earn 75 activity points for the award of the Engineering Degree.

18.2 The Activity Points earned will be reflected on the student's eighth semester Grade Card.

18.3 The activities can be spread over the years (duration of the programme) any time during the semester weekends and holidays, as per the interest & convenience of the students from the year of entry to the programme.

18.4 Activity Points (non-credit) have no effect on SGPA/CGPA point.

18.5 In case students fail to earn the prescribed Activity Points, Eighth semester Grade Card shall be issued only after earning the required Activity Points.

Note: Students are required to be inside the examination hall 20 minutes before the commencement of examination. This is applicable for all examinations (Semester end/Supplementary/makeup) henceforth. Students will not be allowed inside the examination hall after the commencement, under any circumstances.

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LIST OF MAJOR SCHOLARSHIPS

Applicable to	*Types of scholarship*	*Method*	*Website*
For SC/ST Students	***Income : Below Rs.2,50,000/-***	***Online application***	**SSP**
	Income : Above Rs.2,50,000/- to Rs.10,00,000/-		
For Others	***Category I : Income Below Rs.2,50,000/-***	***Online application***	
	Category 2A, 3A, 3B Income Below Rs.1,00,000/-	***Online application***	
	GSB & Brahmins EWS Certificate upto Rs.8,00,000/-	***Online application***	
	Minority students Income Below Rs.2,50,000/-	***Online application***	***NSP & SSP***
Parents must have Beedi Id. Card	***Beedi Scholarship***	***Online application***	**scholarships.gov.in or nsp.gov.in**

1. **Scholarship details will be published in the notice board near College Academic Section. Students must see the notice board and submit the application before due dates.**

2. **All SC/ST and Category I students who have not paid any fee in CET must apply for Fee concession or Scholarship. Otherwise they must pay the tuition fee and college fee.**

3. **The students, who are applying for any of the above scholarship through online, must submit the hardcopy with supporting documents (with attestation) to the academic section in time.**

B. E. SYLLABUS

ARTIFICIAL INTELLEGENCE & MACHINE LEARNING ENGINEERING

III & IV SEMESTER

With

Scheme of Teaching

& Examination

Bachelor of Engineering (B.E) in Artificial Intelligence & Machine Learning (AI & ML)

Faculty

Sl. No.	Faculty Name	Qualification	Designation
1.	Dr. Sharada Udaya Shenoy	B.E, M.Tech., Ph.D	Professor & HOD
2.	Mr. Sudesh Rao	B.E, M.Tech., (Ph.D)	Asst. Prof Gd II
3.	Mrs. Disha D N	B.E, M.Tech., (Ph.D)	Asst. Prof Gd II
4.	Mr. Mahesh B L	B.E, M.Tech.	Asst. Prof Gd II
5.	Mrs. Rakshitha	B.E, M.Tech., (Ph.D)	Asst. Prof Gd I

VISION:

To be a center of excellence in Artificial Intelligence and Machine Learning Engineering education and research, to produce comprehensively trained, technically skilled, ethically strong, innovative engineers to excel globally, take future challenges and contribute to social welfare.

MISSION:

- To provide excellent academic environment to students for continuous improvement in Computer Science, Artificial Intelligence and Machine learning specialization by imparting education with innovation, skills, and positive attitude to make them competent engineers and leaders to solve the real-world problems to inculcate values of professional ethics, leadership qualities and lifelong learning.
- To strengthen the industry partnership for collaborative work and prepare graduates in cutting edge Artificial Intelligence technologies in par with industrial standards by undertaking collaborative projects which offer opportunities for long term interaction between academia and industry.
- To inculcate research, ethical values, professionalism, lifelong learning to make them globally competent and socially committed.
- To provide resources that contribute to congenial learning environment and encourage students to pursue higher education and take competitive exams.

Program Educational Objectives (PEOs)

After few years of graduation, the graduates of B. E in **Artificial Intelligence & Machine Learning** will:

1. Demonstrate technical skills, competency in computer science, artificial intelligence and machine learning and exhibit team management capability with effective communication and responsibility in their career.
2. Emerge as engineering professionals, innovators or entrepreneurs engaged in technology deployment and support the growth of economy of a country with a lifelong learning attitude.
3. Use basic science and engineering ideas to carry out research, pursue higher studies in the multidisciplinary areas to address the basic needs of the society.

Program Outcomes (POs):

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

1. Gain both theoretical and practical knowledge of human cognition, Artificial Intelligence, Machine Learning, Deep learning and data engineering for designing intelligent systems.
2. Apply computational knowledge, tools, techniques and project development skills to provide innovative solutions for social wellbeing.

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

SCHEME OF TEACHING AND EXAMINATION

III SEMESTER

Sl.No	Course and Course Code		Course Title	Department Teaching	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	21AM301	Statistics and Probability Theory	MA	3	0	0	03	50	50	100	3
2	IPCC	21AM302	Data Structures	AME	3	0	2	03	50	50	100	4
3	IPCC	21AM303	Digital Systems and Computer Organization	AME	3	0	0	03	50	50	100	3
4	PCC	21AM304	Introduction to Machine Learning	AME	3	0	2	03	50	50	100	4
5	PCC	21AM305	Object Oriented Programming with Python	AME	0	0	2	03	50	50	100	1
6	HSMC	21HU313	Constitution of India, Professional Ethics	HU	1	0	0	01	50	50	100	1
7	AEC	21HU311	Ability Enhancement Course – III (Enhancing Self Competence)	HU	1	0	0	01	50	50	100	1
8	UHV	21HU314	Social Connect & Responsibility	HU	1	0	0	01	50	50	100	1
				Total	**15**	**1**	**6**	**45**	**450**	**450**	**800**	**18**
12	MA	21MATDIP301	Additional Mathematics - I	MA	2	1	0	03	100		100	0

Ability Enhancement Course - III	
21HU311	Enhancing Self Competency
Audit Course/Value Added Course	
21AM01	C++ Programming

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING
IV SEMESTER

Sl.No	Course and Course Code		Course Title	Department Teaching	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BS	21AM401	Linear Algebra and It's Applications	MA	3	0	0	03	50	50	100	3
2	IPCC	21AM402	Design and Analysis of Algorithms	AME	3	0	2	03	50	50	100	4
3	IPCC	21AM403	Database Systems	AME	3	0	2	03	50	50	100	4
4	PCC	21AM404	Advanced Machine Learning	AME	3	0	0	03	50	50	100	3
5	PCC	21AM405	Introduction to Data Science and R programming	AME	2	0	0	03	50	50	100	2
6	AEC	21AM406	Machine Learning and Data Science Lab	AME	0	0	2	03	50	50	100	1
7	AEC	21AMA4X	Ability Enhancement Course-IV	AME	1	0	0	01	50	50	100	1
8	UHV	21HU315	Universal Human Values	HU	1	0	0	01	50	50	100	1
	HSMC	21HU312	Samskrutika Kannada / Balake Kannada	HU	1	0	0	01	50	50	100	1
9	INT	21INT41	Inter /Intra Institutional Internship	-	-	-	-	-	50	50	100	2
				Total	**18**	**1**	**7**	**27**	**650**	**600**	**1000**	**22**
11	MA	21MATDIP302	Additional Mathematics - II	MA	2	1	0	03	50	50	100	-

Ability Enhancement Course - IV	
21AMA41	UNIX Shell and System Programming
21AMA42	Introduction to JAVAProgramming
21AMA43	Preparing for Industry
21AMA44	Principles and Practices of Software Engineering

STATISTICS &PROBABILITY THEORY			
Course Code	**21AM301**	**CIE Marks**	50
Number of Contact Hours/Week	3:0:0	**SEE Marks**	50
Total Number of Contact Hours	39+0+0	**Exam Hours**	03
Credits – 3			

Course Learning Objectives:

1. Understand the basic principles of probability, Bayes theorem, understand the definitions of discrete, continuous, and joint random variables, compute the mean, variance, and covariance of random variables.
2. Define the binomial, uniform, Poisson, exponential, and normal random variables use these principles in problem solving situations.
3. Understand the concepts of statistical population and sample, variables, and attributes. Learn about moments and their use in studying various characteristics of data and various distributions.
4. Understand the concept of correlation, correlation coefficient, Regression, and concept of Principle of least squares for curve fitting and regression lines.
5. Describe the theory of stochastic processes,Compute probabilities of transition especially for Markov processes

UNIT - I	**Contact Hours**
Probability Theory Finite sample space, conditional probability and independence, Bayes' theorem (overview). One dimensional random variable: discrete and continuous random variable, probability functions, cumulative distribution function, expectation, and variance. Moment generating function- properties. **Distributions:** Binomial, Poisson, Uniform, Normal and exponential distributions. Two-dimensional random variable, covariance, and correlation coefficient.	15
UNIT - II	
Curve Fitting and Regression Least square principles, fitting of straight lines, polynomials, and exponential curves. Correlation, Rank correlation, Coefficient of correlation, Regression Analysis. **Sampling Theory** Random Samples, Sample mean, sample variance sampling distributions of means, proportions, and sums. Sample distribution of variance, confidence limits for means, Central limit theorem, student's t-distribution, Chi-square distribution.	15

UNIT - III	
Stochastic Process Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability, Queuing theory - simple problems.	9

Course Outcomes: At the end of the course student will be able to

1. Apply the concepts of probability, including discrete and continuous random variables, probability distributions, conditioning, independence, expectations, and variances.
2. Define and explain the different statistical distributions (e.g., Normal, Binomial, Poisson) and the areas of their application.
3. Able to apply the central limit theorem to sampling distribution. Translate real-world problems into probability models.
4. Explain the concept of correlation and the difference between positive and negative correlation. Compute the correlation coefficient, Explain, and apply the least square errors method numerically and algebraically to find the curve of best fit.
5. Identify and apply the most appropriate stochastic process technique for a given applied problem. Calculate probabilities of absorption and expected hitting times for discrete time Markov chains with absorbing states.

TEXTBOOKS:

1. Paul L Meyer, "Introductory Probability and Statistical Applications", Addison-Wesley Publishing Company, 2nd Edition (Reprint), 1970.
2. Hogg and Craig, "Introduction to mathematical Statistics", Pearson Education, New Delhi, 6th Edition.

REFERENCEBOOKS:

1. Schaum Outlines, "Probability and Statistics", Mc Graw Hill, 3rd edition, 2010.
2. T. Veerarajan, "Engineering Mathematics", McGraw-Hill, New Delhi, 2008.
3. B. V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw –Hill, New Delhi,2010.

E-Books / Online Resources/MOOCs:

1. https://nptel.ac.in/courses/110107114
2. https://nptel.ac.in/courses/111105090
3. https://nptel.ac.in/courses/111102098

Mode of Teaching and Learning:

Classroom teaching.
Use of mathematical softwares (such as MATLAB, MATHEMATICA, SAGE, R, ETC.) as teaching aid.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and of Semester End Exam (SEE) is 50%. The student must obtain a minimum of 40% marks individually both

in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this, grades will be awarded.

Continuous Internal Evaluation:
Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%).
The class teacher must decide the topics for closed book test and Written Quiz. The methods of CIE for the subject must be announced at the beginning of the course.

Semester End Examination:
There will be 8 questions of 20 marks each in the question paper categorized into 3 UNITs as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from UNIT - I & UNIT – II and 1 full question from UNIT – III.

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2												
CO2	2	2												
CO3	3	1												
CO4	3	2												
CO5	3	2												

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1, 2	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L4
CO2	1, 2	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L2
CO3	1, 2	1.3.1,1.4.1, 2.1.3	L2
CO4	1, 2	1.3.1,1.4.1, 2.1.3	L3
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L3

DATA STRUCTURES

Course Code	**21CS302/21AI302/21CC302/21IS302**	**CIE Marks**	50
Number of Contact Hours/Week	**3:0:2**	**SEE Marks**	50
Total Number of Contact Hours	**39 + 26(lab)**	**Exam Hours**	03

Credits – 3

Course Learning Objectives:

1. Outline the concepts of data structure, it's operations, Memory allocation functions and design the programs using arrays and structures, pointers, pointer to structure.
2. Implement linear data structure stack and usage of stacks in various applications.
3. Implement linear data structure Ordinary Queue, Circular Queue, and priority queues
4. Implement the operations of singly linked lists and circular linked lists, doubly linked list and circular doubly lists.
5. Identify and differentiate different types of binary trees and binary search trees da-ta structures and also implement them and illustrate threaded binary trees, expression trees, graph representation and techniques of hashing.

UNIT - I	Contact Hours
Introduction: Data Structure Definition, Classification (Primitive and non-primitive), da-ta structure operations, Pointers and Dynamic Memory Allocation functions with programming examples **Arrays and Structures:** Arrays in C, dynamically allocated arrays, Structures and Union, Array of Structures and Pointer to Structure, Programming Example. **Linear Data Structures-Stack:** Introduction and Definition, **Representation of stack:** Array and structure representation of stacks, Primitive operations on stacks **Applications of Stack:** Conversion of Expressions **Algorithms and C programs with tracing Examples:** For evaluating postfix expression, infix to postfix conversion. **Recursion**: Definition, Implementation, Examples on Recursion with tracing: Factorial function, Fibonacci sequence and Tower of Hanoi	15
UNIT – II	
Linear Data Structures-Queue: Introduction and Definition, **Representation of Queue**: Array and Structure representation of Queue, **Other queue structures:** circular queue, priority queue. **Linear Data structures-Linked List: S**ingly Linked List and chains, Representing chain in C using dynamic variables,Inserting and deleting nodes, Other list Operations on singly Linked List, Linked Stack and Queues, Header Nodes, Representation of Linked list using arrays. **Circular Linked List, Doubly Linked List and Circular doubly Link list** : Representa-tion and Operations	15

UNIT – III	
Nonlinear Data Structures – Tree data structures: Introduction: Tree definition, Terminology, **Binary Trees:** Definition, Types, Proper-ties, **Representation of Binary Tree**: Array representation, Linked representation, Binary Tree traversals- Preorder, Inorder and postorder. **Threaded binary Trees**: Definition, types, Data structure and memory representation of threaded tree, **Binary Search Tree**: Definition, Construction- Searching, Insertion operations, deletion process, Traversal examples **Expression Tree:** Constructing expression tree for a given expression, traversals, Evaluation of expression, programming examples **Nonlinear Data structures – Graphs: Representation of graphs**: Definition, types and terminology, Matrix representation, Adjacency list chain and sequential representation. **Hashing:** Hash Table organizations, Hashing Functions, Overflow handling.	9

Course Outcomes: After the study of this course, the students will

1. Acquire the fundamental knowledge of various types of data structures, dynamic memory allocation and design the programs using arrays, structures, and pointers

2. Apply the fundamental knowledge of data structures to **design** stack and use them for solving problems.

3. Apply the fundamental knowledge of data structures to **design** queues and use them for solving problems.

4. Design and develop singly linked lists, circular linked lists, and doubly linked list.

5. Acquire the knowledge of trees and **employ** binary trees and binary search tree data structure, advanced trees, representation of graphs and hashing techniques.

TEXTBOOKS:

1. **Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd edition, Universities Press, 2014.**
2. **Seymour Lipschutz, "Data Structures, Schaum's Outlines", Revised 1st edition, McGraw Hill, 2014.**

REFERENCEBOOKS:

1. Aaron M. Tenenbaum, YedidyahLangsam& Moshe J. Augenstein, "Data Structures using C", Pearson Education/PHI, 2009.

E-Books / Online Resources/ MOOC:

1) Data Structures Using C, ISRD Group, Tata McGraw Hill, 2006
2) Data Structures Using C, Reema Thareja, 2nd edition, Oxford University Press, 2014.
3) Introduction to Data Structures by edx , URL: https://www.edx.org/course/
4) Data Structure by Harvard Extension School, URL: http://www.extension.harard.
5) https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
6) https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html

SEE SCHEME: There will be **8** questions of **20** marks each in the question paper divided into **3 UNITs** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **UNIT - I & UNIT – II** and **1** full question from **UNIT – III.**

Table 1: Mapping Levels of COs to POs / PSOs														
COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	1	**3**					1				1	3	
CO2	3	1	3					1				1	3	
CO3	3	1	2					1				1	3	
CO4	3	1	**3**					1				1	3	
CO5	3	1	**3**					1				1	3	

3: Substantial (High) 2: Moderate (Medium)1: Poor (Low)

Table 2: Mapping of COs to PIs, POs and BTL			
Course Outcomes (COs)	**Program Outcomes (POs) Addressed**	**Performance Indicators (PI)**	**Bloom's Taxonomy Level (BTL)**
CO1	1,2	1.3.1, 1.4.1, 2.1.3	L2
CO2	1,2,3	1.4.1, 2.1.3, 2.3.1, 3.2.1, 3.2.2	L4
CO3	1,2, 3	1.4.1, 2.1.2, 2.1.3, 2.4.1, 3.3.2	L4
CO4	1,2	1.3.1, 1.4.1, 2.1.3	L3
CO5	1,2	1.3.1, 1.4.1, 2.1.2, 2.1.3, 2.4.1	L3

DATA STRUCTURES LAB

Course Code	**21AM302**	**CIE Marks**	**50**
Number of Contact Hours/Week	**0:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**26**	**Exam Hours**	**03**

Credits – 1

Course Learning Objectives:

1. To implement linear data structures of stacks and queues
2. To implement linked list and its operations.
3. To execute expression trees, B trees, B+ trees and hashing.

List of Experiments

Students must write, execute, and test programs covering the syllabus of 21AM302.

Typical problems that may be tried are (not limited to)

1. Pointer implementations using arrays and structures
2. Stack static implementation.
3. Queue static implementation.
4. Application of stack data structure.
5. Different types of queues.
6. Recursion.
7. Dynamic implementation of stack data structure.
8. Dynamic implementation of queue data structure.
9. Singly Linked list implementation.
10. Circular Linked list implementation and various operations on it.
11. Doubly linked list and circular doubly linked list implementation and various operations on it.
12. Binary / Binary search tree construction and tree traversal operations.
13. Expression tree construction from postfix expression.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Acquire fundamental knowledge of structures and pointers and apply the concept in designing data structures such as stack and its applications for analysing and solving problems.
2. Acquire knowledge of structures and pointers and apply the concept in designing data structures such as queue and its applications for analysing and solving problems.
3. Design and implement various linear data structures like linked list and its different types by applying basic programming concepts.
4. Design and implement various linear data structures like doubly linked lists by applying basic programming concepts.
5. Analysing and solving complex engineering problems ethically by designing various nonlinear data structures like binary trees.

E-Books / Online Resources/MOOCs:

1. https://nptel.ac.in/courses/106105225
2. https://www.coursera.org/specializations/data-structures-algorithms

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	1					1				1		2
CO2	3	2	1					1				1		2
CO3	3	2	1					1				1		2
CO4	3	2	1					1				1		2
CO5	3	2	1					1				1		2

1: Low, 2: Medium, 3: High

Table 2: Mapping of Cos to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2	1.3.1, 1.4.1, 2.1.3	L2
CO2	1,2,3	1.4.1, 2.1.3, 2.3.1, 3.2.1, 3.2.2	L4
CO3	1,2, 3	1.4.1, 2.1.2, 2.1.3, 2.4.1, 3.3.2	L4
CO4	1,2	1.3.1, 1.4.1, 2.1.3	L3
CO5	1,2	1.3.1, 1.4.1, 2.1.2, 2.1.3, 2.4.1	L3

DIGITAL SYSTEMS AND COMPUTER ORGANIZATION			
Course Code	**21AM303**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:0**	**SEE Marks**	**50**
Total Number of Contact Hours	**39**	**Exam Hours**	**03**
Credits – 3			

Course Learning Objectives (CLO)

The primary Course Learning Objective is to introduce the digital design of computers and the Architectural and organisational perspective of computers.

This course will enable students to:

1. Outline the concepts of basic gates and combinational logic circuits and data pre-processing circuits
2. Understand the basic structure of computer organization, basic processing UNIT and arithmetic operations.
3. Identify the concepts of pipelining and its hazards

UNIT - I	**Contact Hours**
Digital Logic: The basic gates-NOT, OR, AND, Universal logic gates-NOR, NAND, Review of Basic Logic gates, Positive and Negative Logic **Combinational logic circuits:** Boolean laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Map Simplifications, Don't-care Conditions, Product-of-sums Method, Product-of-sums simplifications, Simplification by Quine-McClusky Method. **Data-Processing Circuits:** Multiplexers, De-multiplexers, Decoders-1-of-16 Decoder, BCD to Decimal Decoders, Seven Segment Decoders, Encoders, Exclusive-OR Gates, Parity Generators and Checkers, Magnitude Comparator. **Tutorial**: Visualization of Logic Gates, Boolean Functions using Xilinks/Verilog.	15
UNIT - II	
Basic Computer Organization: Basic structure of computer and its components, Machine Instructions and Programs, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Stacks and Queues **Basic Processing UNIT:** Basic Processing UNIT: Fundamental Concepts, Execution of a Complete Instruction, Single Bus Organization, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. **Arithmetic Operations:** adder, carry propagation**,** Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers and Operations on numbers in IEEE format. **Tutorial**: Visualization of Multiplexers, Encoders, Decoders using Xilinks/Verilog.	15

UNIT - III	
Pipelining: Role of cache memory, pipeline performance, Data hazards: Operand forwarding, Handling data hazard in software, Instruction Hazards: Unconditional branches, Conditional branches, prediction, structural hazards. **Tutorial:** Basic assembly program structure, adding two numbers, sum of "N" Numbers	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Simplify the combinational logic circuits using Boolean algebra theorems, K maps and Quine Mclusky Method.
2. Study the working and visualization of various logic circuits encoders, decoders, multiplexers etc.
3. Comprehend the basic structure of processors, and modern trends in process or technology.
4. Describe the arithmetic operations performed by ALU.
5. Describe and identify the concept of pipeline and its hazards.

TEXTBOOKS:

1. Donald P Leach, Albert Paul Malvino& Goutam Saha, "Digital Principles and Applications", 8th Edition, Tata McGrawHill, 2015
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, Tata McGrawHill, 2002.
3. John L. Hennessey and David A. Patterson, "Computer Architecture, A Quantitative Approach", 4th Edition, Elsevier, 2007

REFERENCEBOOKS:

1. Stephen Brown, ZvonkoVranesic, "Fundamentals of Digital Logic Design with VHDL", 2nd Edition, Tata McGraw Hill,2005.
2. R. D. Sudhaker Samuel, "Illustrative Approach to Logic Design", Sanguine-Pearson,2010.
3. M. Morris Mano, "Digital Logic and Computer Design", 10thEdition, Pearson,2008.
4. WilliamStallings, "ComputerOrganization&Architecture",7thEdition, PHI,2006.
5. Vincent P. Heuring& Harry F. Jordan, "Computer Systems Design and Architecture", 2ndEdition, Pearson Education,2004.
6. David A. Patterson, John L. Hennessy, "Computer Organization and Design", 4thEdition Elsevier,2012.

E-Books / Online Resources/MOOCs:

1. https://nptel.ac.in/courses/117105078
2. https://www.coursera.org/learn/digital-systems

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2	2		2									2
CO2	3	2	2		2									2
CO3	3	2												2
CO4	3	2												2
CO5	3	2												2

1: Low, 2: Medium, 3: High

Table 2: Mapping of Cos to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L3, L4
CO2	1, 2, 3, 5	1.3.1,1.4.1, 2.1.3, 3.2.1,5.1.1	L2, L4
CO3	1, 3	1.3.1,1.4.1, 2.1.3	L2
CO4	1, 2	1.3.1,1.4.1, 2.1.3	L2, L4
CO5	1, 2	1.3.1,1.4.1, 2.1.3	L2

INTRODUCTION TO MACHINE LEARNING			
Course Code	**21AM304**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**39 + 26**	**Exam Hours**	**03**
Credits – 3			

Course Learning Objectives:

1. Learn the fundamentals of machine learning and data preprocessing
2. Outline the concepts of decision tree, rule based and nearest neighbor classification techniques
3. Understand the concepts of Bayesian classifiers, and association analysis
4. Describe unsupervised learning techniques with example
5. Understand dimensionality reduction techniques

UNIT - I	Contact Hours
Machine learning Foundations: **Introduction to machine learning:** What is machine learning? Examples of machine learning applications: Learning associations, Classification, Regression, Unsupervised learning, Reinforcement learning **Data preprocessing**: Types of data, attributes and measurements, types of datasets, Data quality, Aggregation, Sampling, Dimensionality reduction, Feature subset selection, Feature creation, Discretization and binarization, variable transformation **Supervised learning algorithms I:** **Decision tree induction**, Preliminaries, general approach to solving a classification problem how a decision tree works, how to build a decision tree, methods for expressing attribute test conditions measures for selecting the best split, algorithm for decision tree induction **Nearest-Neighbour classifier:** Algorithm, characteristics of nearest neighbour classifier	15
UNIT – II	
Supervised learning algorithms II: **Bayesian classifiers:** Bayes theorem, using bayes theorem for classification, Naïve bayes classifier, Bayes error rate **Support vector machine:** Maximum margin hyperplanes, Linear SVM: separatable case **Association Analysis:** Frequent itemset generation, The Apriori principle, candidate generation and pruning, Support counting, Rule generation: Confidence based pruning, Rule generation in apriori algorithm **Regression:** Simple linear regression, least square method, analysing regression errors, analysing goodness of fit, multivariate regression. **Unsupervised learning algorithms** **Cluster analysis:** What is cluster analysis? Different types of clustering, different types of clusters **K-means clustering:** The basic K-means algorithm, K-means additional issues, Bisecting K-means, K-means and different types of clusters **Agglomerative Hierarchical clustering:** Algorithm, specific techniques, key issues in hierarchical	15

clustering **DBSCAN:** Density centre-based approach, DBSCAN algorithm, **BIRCH algorithm:** Building CF tree, Global clustering.	
UNIT – III	
Dimensionality Reduction: Introduction, Subset selection, Principal component analysis, Feature embedding, factor analysis, singular value decomposition and matrix factorization, multi-dimensional scaling **Ensemble methods:** Rationale for ensemble method, methods for constructing an ensemble classifier, Bias-variance decomposition, Bagging, Boosting, Random forests, Empirical comparison among ensemble methods, class imbalance problem, Receiver operating curve (ROC curve)	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Describe the machine learning techniques and its types
2. Analysis of association techniques using machine learning algorithm
3. Apply different classification techniques on real time data
4. Apply different types of clustering techniques
5. Understand evaluation measures, dimensionality reduction techniques

TEXTBOOKS:

1. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, 2014.
2. Introduction to Data Mining-Pang-NingTan, Michael Steinbach,Vipin Kumar, Pearson Education, 2009.

REFERENCEBOOKS:

1. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
2. R. O. Duda, P. E. Hart and D. G. Stork Pattern Classification, Wiley Publications, 2001
3. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
4. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
5. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
7. S. Russel and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2009.
8. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
9. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.
10. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
11. Machine Learning: The New AI, By EthemAlpaydin, The MIT Press, 2016.

E-Books / Online Resources/ MOOC:

1. https://www.javatpoint.com/machine-learning - Introduction to machine learning
2. https://onlinecourses.nptel.ac.in/noc22_cs29/preview- NPTEL course on introduction to machine learning.
3. https://www.javatpoint.com/birch-in-data-mining - BIRCH clustering algorithm

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2		2								3	
CO2	3	2	2		2								3	
CO3	3	2	2		2								3	
CO4	3	2	2		2								3	
CO5	3	2	2		2								3	

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.3, 3.2.1, 5.1.1	L3
CO2	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.3, 3.2.1, 5.1.1	L3
CO3	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.3, 5.1.1	L3
CO4	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.3, 5.1.1	L3
CO5	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.3, 3.2.1, 5.1.1	L3

INTRODUCTION TO MACHINE LEARNING LAB

Course Code	**21AM304**	**CIE Marks**	**50**
Number of Contact Hours/Week	**0:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**26**	**Exam Hours**	**03**

Credits – 1

Course Learning Objectives:

1. Learn about uses of matlab and its functionalities
2. Outline about the standardization of datasets
3. Learn Feature extraction for text data
4. Implement different supervised and unsupervised algorithms
5. Implement Dimensionality reduction techniques using PCA

Part-A : Pre-Requisites

1. An experiment to illustrate the seaborn library and matplot library
2. An experiment to demonstrate the data standardization in data pre-processing
3. Demonstrate how imbalanced dataset can be handled in machine learning
4. Demonstrate how feature extraction can be implemented on text data
5. Demonstrate the how text data can be pre-processed in machine learning

Part-B : Machine learning algorithms

1. Illustrate the dimensionality reduction using PCA and predict the target using any suitable model
2. Illustrate the usage of factorization and its implementation on any given dataset
3. Predict Rock vs Mine using machine learning using logistic regression model (supervised learning model) and demonstrate the label prediction for any one of the instances
4. Fake news prediction (textual data) using machine learning by using logistic regression and encode the text using Tf-ID Vectorizer
5. Build a loan status prediction system and predict whether the person is eligible for taking loan or not using support vector machine model
6. Car price prediction of used cars linear and lasso regression model and compare the accuracy
7. Customer segmentation using K-means clustering model and visualize the predicted clusters using plots
8. Build a movie recommendation system using cosine similarity approach
9. Market basket analysis using apriori algorithm on the given dataset
10. Demonstrate the use of ensemble method and compare the accuracy with any other two machine learning models

Mini project

Course Outcomes:

Upon completion of this course, students will be able to:

1. Implement different supervised machine learning algorithms
2. Implement unsupervised techniques for given data
3. Implement Regression algorithms on given data
4. Perform dimensionality reduction techniques on the given data
5. Analyse data pre-processing techniques

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	2		2								3	
CO2	3	2	2		2								3	
CO3	3	2	2		2								3	
CO4	3	2	2		2								3	
CO5	3	2	2		2								3	

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO2	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO3	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO4	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO5	PO1, PO2, PO3, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3

OBJECT ORIENTED PROGRAMMING WITH PYTHON

Course Code	**21AM305**	**CIE Marks**	**50**
Number of Contact Hours/Week	**0:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**26**	**Exam Hours**	**03**

Credits – 1.5

Course Learning Objectives:

This course will enable students to:

1. Describe the concepts like strings, conversion of strings to numbers, lists, tuples, and dictionaries and use these in python programming.
2. Illustrate the functions, recursive functions, and object-oriented programming concepts in Python.
3. Explain the elementary programming constructs and file operations and use it in Python programming.
4. Construct a Graphical User Interface (GUI) and write a multi-threaded and a Client/Server program and web application in Python.

List of Experiments

Students must write, execute, and test programs.

Typical problems that may be tried are

1. Function overloading and inline function
2. Simple class and objects creation.
3. Array of objects.
4. Object as arguments.
5. Friend functions
6. Static data member and function.
7. Constructors and its types
8. Inheritance and its types.
9. Virtual functions and pure virtual functions.
10. Templates concept.
11. Exception handling mechanism.
12. Operator overloading.
13. File handling.
14. UI design using Tkinter
15. **Mini Project**

Course Outcomes:

Upon completion of this course, students will be able to:

1. Identify and analyze the engineering problem and develop the Python programs for engineering problems using the knowledge of strings, conversion of strings to numbers, lists, tuples and dictionaries.
2. Design and implement programs program that uses of loops, Exception and numpy
3. Apply the knowledge of functions and object-oriented programming to analyze the problem and develop program in python.
4. By Applying the Knowledge of python basic program constructs and file operations, analyze and develop the solutions for engineering problem.
5. Formulate the complex engineering problem and develop graphical user interface using the knowledge of python programming.

E-Books / Online Resources/MOOCs:

1. https://www.coursera.org/learn/object-oriented-python

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2	3			2	2						3	
CO2		2	2			2							3	
CO3		3	3			3	3						3	
CO4		2	3			3	3						3	
CO5		2	3			2	2						3	

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	2,3,6,7		L3
CO2	2,3,6		L4
CO3	2,3,6,7		L3
CO4	2,3,6,7		L3
CO5	2,3,6,7		L4

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS

Course Code	**21HU313**	**Course Type**	**HU**
Teaching Hours/Week (L:T:P:S)	**1+0+0**	**Credits**	**01**
Total Teaching Hours	**13**	**CIE + SEE Marks**	**50+50**

Credits – 2

Course Learning Objectives:

1. Inculcate Social and Political consciousness of the Indian Polity.
2. Understand their Obligations, Responsibilities, Privileges and Rights, Duties and the Role that they have to play in deciding the Administrative Machinery of the country.
3. Develop National and Patriotic Spirit.
4. Understand the nature and character of relations between union and state governments.
5. Divulge the students about the statutory institutions and policies.

UNIT - I	Contact Hours
Evolution of the Indian Constitution: 1909 Act, 1919 Act, 1935 Govt of India Act, Constituent Assembly: Composition and Functions, Basic structure of Indian Constitution, Fundamental features of the Indian Constitution, Salient Features of Indian Constitution	06
UNIT - II	
Structure of Government Union Government: Legislature; Executive-President, Prime Minister, Council of Ministers. Judiciary, Judicial Review and activism State Government: Executive: Governor, Chief Minister, Council of Ministers Local Government: Panchayat Raj Institutions, Urban Governance	05
UNIT - III	
Statutory Institutions Elections - Election Commission of India, National Human Rights Commission, National Commission for Women	02

Course Outcomes:

At the end of the course student will be able to

1. Analyze the legalities and related issues of drafting, adoption and enforcement of the Indian Constitution as a fundamental law of the nation and the provisions and privileges of Indian Citizenship
2. Understand and judiciously use the fundamental rights, fundamental duties and privileges envisaged in the constitution propagating social harmony and equality and respecting the rights and liberties of other people.
3. Contribute in protecting and preserving the sovereignty and integrity of India and have a compassion to all living creatures, uphold sense of brotherhood ness among all citizens of the nation and promote peace and harmony
4. Respect the Constitutional Institutions and all noble ideals cherished during Indian struggle for freedom
5. Develop a Spirit of belongingness to the country**.**

TEXTBOOKS:

1. Introduction to the Constitution of India; Dr. Durga Das Basu; Twentieth Edition, Reprint 2011; LexisNexis Butterworths Wadhwa, Nagpur, Haryana, India.
2. Introduction to Constitution of India; M.V. Pylee; Fourth Revised Edition, 2005; Vikas Publishing House Pvt. Ltd., New Delhi.

REFERENCEBOOKS:

1. Introduction to Constitution of India; Brij Kishore Sharma; Second Edition, 2004; Prentice Hall of India Pvt. Ltd., New Delhi.
2. An Introduction to Constitution of India and Professional Ethics; Prof. B R Venkatesh and Merunandan K B; Merugu Publications, Bangalore; Second Edition, 2007.

E-Books / Online Resources/MOOCs:

1. https://pothi.com/pothi/book/ebook-ministry-law-and-justice-constitution-india
2. iasplanner.blogspot.com/2010/11/free-ebook-download-constitution-of.html
3. www.iasabhiyan.com
4. Samvidhaan, Documentary by Prasaar Bharathi

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1						3	1	3		1				
CO2						3	1	3		1				
CO3						3	1	3		1				
CO4						3	1	3		1				
CO5						3	1	3		1				

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	6, 7, 8, 10		L2
CO2	6, 7, 8, 10		L2
CO3	6, 7, 8, 10		L2
CO4	6, 7, 8, 10		L2
CO5	6, 7, 8, 10		L2

ENHANCING SELF COMPETENCE

Course Code:	**21HU311**	**CIE Marks**	**50**
Number of Contact Hours/Week	**1-0-2**	**SEE Marks**	**50**
Total Number of Contact Hours	**39**	**Exam Hours**	**3 Hours**

Credits – 2

Course Learning Objectives:

By the end of the course, students should be able to:

1. Introspect and learn about oneself.
2. Develop professional writing skills.
3. Acquaint with the various social behaviour and etiquette.
4. Apply the techniques of fundamental communication skills.
5. Develop necessary techniques for formal presentations and be acquainted with cultural diversities & issues related to gender sensitivity.

Pre-requisites:

Students must have essential knowledge of English Language Communication.

UNIT - I	**Contact Hours**
Personality Traits: Types & Kinds of personality, Ways to Identify Self (SWOT Analysis, Johari Window), Concepts of Self-Management and Self-Motivation	06
UNIT - II	08
Effective Communication Skills: One-way and two-way Communication (Square activities), Active listening, Speaking	
UNIT - III	08
Effective Communication Skills: One-way and two-way Communication (Square activities), Active listening, Speaking	
UNIT - IV	07
Social Behaviour and Cultural Etiquette: Time Management, Personal Grooming, Hygiene, Dressing for different occasions, Making Small Talk, Showing Respect, Feedback, Value, Manners, Customs, Language, Tradition	
	10

UNIT - V	
Professional Presentation Techniques: Group discussion, Formal Presentation, Awareness of the cultural diversity of the workplace, global work cultures	

Course Outcomes (CO):

By the end of the course, students will be able to:

1. Understand the importance of human conduct.
2. Demonstrate knowledge of theory and competence in office communication.
3. Develop and assess various types of communication.
4. Be Familiar with the current practices of social behaviour.
5. Prepare and deliver presentation appropriate for the workplace.

TEXTBOOKS:

1. Donald P Leach, Albert Paul Malvino& Goutam Saha, "Digital Principles and Applications", 8th Edition, Tata McGrawHill, 2015
2. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, Tata McGrawHill, 2002.
3. John L. Hennessey and David A. Patterson, "Computer Architecture, A Quantitative Approach", 4th Edition, Elsevier, 2007

REFERENCEBOOKS:

1. Adler, Ronald B & Jeanne Marquardt Elmhorst. Communicating at Work – Principles and Practices for Business and the Professions. 6th Ed. McGraw Hill College.
2. Covey, Stephen R. The 7 Habits of Highly Effective People. Great Britan: Simon &Schuster, 1994.
3. Gulati, Sarvesh Corporate grooming and Etiquette. New Delhi: Rupa Publications India Pvt. Ltd., 2010.
4. Luthans, Fred. Organizational Behaviour. McGraw Hill International.
5. Rath, Tom Strengths Finder 2.0. New York: Gallup Press, 2007.
6. Rizvi, M Ashraf. Effective Technical Communication. New Delhi: Tata McGraw- Hill, 2005.
7. Robbins, Stephen P. Organizational Behaviour. New Delhi: Prentice Hall.
8. Dale Carnegie, How to Win Friends and Influence People, Latest Edition,2016. Gallery Books, New York.

E-Books / Online Resources/MOOCs:

1. https://onlinecourses.nptel.ac.in/noc21_hs02/preview

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1						1		3		3				1
CO2								1		2				1
CO3										3				1
CO4						2		1						1
CO5						2		1						1

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	6,8,10		L3
CO2	8,10		L2
CO3	10		L2
CO4	6,8		L3
CO5	6,8		L3

SOCIAL CONNECT & RESPONSIBILITY			
Course Code	**21HU314**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**1:0:0:0**	**SEE Marks**	**50**
Total Hours	**13**	**Credits**	**01**
Semester	**III/IV**		

Prerequisites
Students just need to have understanding of basic social relationships and behavior.

Course Learning Objectives (CLO)
By the end of the course, students should be able to:
1. Understand the Rural Society
2. Acquire the knowledge about rural economy
3. Know the working of rural administration
4. Know the different rural schemes
5. Understand the working of Corporate Social Responsibility (CSR)

Course Content:

Unit	Topic	No of Hours
I	**Appreciation of Rural Society:** Rural Lifestyle, Rural Society, Caste and Gender realtions, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure. **Understanding rural economy & livelihood:** Agriculture, Farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.	05
II	**Rural Institutions:** Traditional rural organizations, Self-help groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civic society, local administration **Rural Development Programmes:** History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bacho – Beti Padhao, Ayusham Bhart, Swatchh Bharat, PM Awaas Yojana, Skill Inida, Grama Panchayat Decentralised Planning, NRLM, MNREGA, etc.	05

III	Corporate Social Responsibility: Global Guidelines on CSR, Growing Importance of CSR, CSR in India	03

Course Outcomes (CO)

By the end of the course, students will be able to:

CO 1 Understand the rural society, acquire the knowledge about rural economy
CO 2 Know the working of rural administration and different rural schemes
CO 3 Aware of working of Corporate Social Responsibility

Suggested Learning Resources:

TEXT BOOK

1. Unnat Bharat Abhiyan, UGC, 2020
2. “Corporate Social Responsibility in India”, Sanjay K Agarwal, SAGE Publication, 2008

Web-links:

https://unnatbharatabhiyan.gov.in/app/webroot/files/brochure.pdf

ADDITIONAL MATHEMATICS-I

Course Code	**21MATDIP301**	**Course Type**	**BSC**
Teaching Hours/Week (L:T:P: S)	**3:0:0**	**Credits**	**00**
Total Teaching Hours	**39+0+0**	**CIE (NO SEE) Marks**	**100**

Teaching Departments : Mathematics

Mandatory Non – credit course (MNC): This course is prescribed to the lateral entry Diploma holders admitted to III semester of BE/B.Tech., they shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfil the requirements during subsequent semester/s to appear for CIE.
MNC Courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the courses shall be mandatory for the award of degree

Course Learning Objectives:
This course will enable the students to master the basic tools of differential calculus, partial differentiation, Laplace Transforms, and Integration and become skilled for solving problems in science and engineering.

UNIT – I

Limit, continuity, differentiation rules-product rule, quotient rule and chain rule. Taylor's series, Maclaurin's series of simple functions in single variable.

Partial Differentiation
Definition, simple problems to find partial differentials, total differentiation, differentiation of composite functions, illustrative examples, and problems. Taylor's and Maclaurin's series for a function of 2 variables **12 Hours**

UNIT – II

Laplace Transforms
Definitions, transforms of elementary functions, transforms of derivatives and integrals- properties

Inverse Laplace Transform
Inverse Laplace transforms and properties. Solutions of ordinary differential equations. Applications to engineering problems. **15 Hours**

UNIT – III

Integral Calculus-I **12 Hours**
Introduction, rules of integration, solution of integrals using the methods-substitution and partial fraction, integrals of standard functions, definite integral, simple problems.

Integral Calculus-II

Double integrals, change of order of integration, change into polar coordinates. Triple integrals, simple Problems, and applications.

Course Outcomes:

At the end of the course student will be able to

1. Find the Taylors series and Maclaurins series expansion of simple functions
2. Solve problems on partial differentiation
3. Apply Laplace transform properties to elementary functions
4. Use Laplace transform Technique to solve Differential Equations
5. Understand the concepts of integral Calculus

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 100% (No Semester End Exam (SEE)). The student must obtain minimum of 40% inCIE to pass.

Continuous Internal Evaluation:

1. Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%).
2. The class teacher must decide the topic for closed book test and Written Quiz. In the beginning only teacher must announce the methods of CIE for the subject.

TEXTBOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 43rd Edition, 2015.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition (Reprint), 2016.

REFERENCEBOOKS:

1. G.B. Thomas and R.L.Finney, "Calculus and Analytic geometry", Pearson, 2002.
2. T. Veerarajan, "Engineering Mathematics", McGraw-Hill, New Delhi, 2008.
3. B. V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw –Hill, New Delhi,2010

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1												1
CO2	2	3	3											2
CO3	2	3	2											2
CO4	2	2												2
CO5	2	3												3

1: Low, 2: Medium, 3: High

Table 2: Mapping of Cos to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,2		L2
CO2	1,2,3		L4
CO3	1,2,3		L3
CO4	1,2		L2
CO5	1,2		L2

IV SEMESTER

LINEAR ALGEBRA & IT'S APPLICATIONS
(Common to AM\CC\CS\IS)

Course Code	**21AM401**	**Course Type**	**BSC**
Teaching Hours/Week (L:T:P: S)	**3:0:0**	**Credits**	**03**
Total Teaching Hours	**39+0+0**	**CIE + SEE Marks**	**50+50**
Teaching Department: Mathematics			

Course Learning Objectives:

1. Learn to apply elementary row operations to solve linear systems of equations and find the eigenvalues and eigenvectors of a matrix.
2. Find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial **and will know how to diagonalize a matrix, when this is possible**
3. Understand real vector spaces and subspaces, linear independence and dependence, and find basis and dimension of a vector space, row space, column space and null space of a matrix.
4. Define a linear transformation and find the matrix associated with it; determine the kernel and range of a transformation; find inner product of vectors, orthogonal and an orthonormal basis.
5. Learn basic concepts of real quadratic forms, decomposition of matrices and solve problems on the same.

UNIT - I

Matrices — **14 Hours**

Elementary transformation of a matrix, Echelon form and rank of a matrix. Consistencyand solution of system of linear equations; Gauss elimination method, LU Decomposition method and approximate solution by Gauss Seidel method.

Trace, relation between trace and Eigen values of a matrix, Eigen values and Eigen vectors of symmetric matrices, Rayleigh's power method to find the largest Eigen values and Eigen vectors of square matrices. Diagonalization.

UNIT - II

Vector Space — **15 Hours**

Vector spaces, subspaces, bases and dimension, coordinates, row space, column space and null space.

Linear Transformations

Linear transformations, algebra of linear transformations, representation of transformations by matrices, isomorphism, Range and Null space of a linear transformation. Rank – nullity theorem (Without Proof). Inner products, orthogonal sets of projections, Gram-Schmidt's

orthogonalization process.	

UNIT - III

Matrix Decompositions Quadratic forms, QR-factorization; least-squares problems; singular value decomposition and principal component analysis.	**9 Hours**

Course Outcomes: At the end of the course student will be able to

1. Solve the system of linear equations for exact or approximate solutions.
2. Compute and use eigenvectors and eigenvalues and perform diagonalization of matrices
3. Analyze finite dimensional vector spaces and subspaces over a field and their properties, including the basis structure of vector spaces.
4. Relate matrices and linear transformations, apply the properties of inner product and determine orthogonality on vector spaces and orthogonal bases.
5. Derive and utilize Quadratic forms, SVD and QR factorization of the matrix for efficiently solving problems in practice.

Mode of Teaching and Learning:

Class room teaching.
Use of mathematical software (such as MATLAB, MATHEMATICA, SAGE, ETC.) as teaching aid.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and of Semester End Exam (SEE) is 50%. The student must obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this, grades will be awarded.

Continuous Internal Evaluation:

1. Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%).
2. The class teacher must decide the topics for closed book test and Written Quiz. The methods of CIE for the subject must be announced at the beginning of the course.

Semester End Examination:

There will be **8** questions of **20** marks each in the question paper categorized into **3 UNITs** as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **2** full questions each from **UNIT - I**&**UNIT – II** and **1** full question from **UNIT – III**.

TEXTBOOKS:

1. Kenneth Hoffman And Ray Kunze, “Linear Algebra”, Prentice-Hall, 2nd edition, 1971
2. David C. Lay, “Linear Algebra and Its Applications”, Pearson Education, Inc., 5th edition, 2016.

REFERENCEBOOKS:

1. Seymour Lipschutz And Marc Lars Lipson, "Schaum's outlines - Linear Algebra", McGraw-Hill, 4th Edition 2002.
2. Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge Press, 5th edition, 2016
3. Gerald Farin, Dianne Hansford, "Practical Linear Algebra, A Geometry Toolbox", Chapman and Hall, 4th edition, 2021.
4. Sheldon Axler, "Linear Algebra Done Right", Springer Nature, 3rd edition, 2015

E Books / Moocs/ NPTEL:

1. https://nptel.ac.in/courses/111101115
2. https://archive.nptel.ac.in/courses/111/106/111106135/
3. https://nptel.ac.in/courses/110104024

Table 1: Mapping Levels of COs to POs& PSOs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1												
CO2	2	3												
CO3	2	1												
CO4	2	2												
CO5	3	2												

1: Low, 2: Medium, 3: High

Table 2: Mapping of Cos to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2		L3
CO2	1,2		L2
CO3	1,2		L2
CO4	1,2		L4
CO5	1,2		L4

DESIGN AND ANALYSIS OF ALGORITHMS			
Course Code	**21AM402**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**39 + 26**	**Exam Hours**	**03**
Credits – 4			

Course Learning Objectives:

This Course will enable students to:

1. Analyse the non-recursive and recursive algorithms and to represent the efficiency of these algorithms in terms of the standard Asymptotic notations.
2. Devise the Brute Force and Divide and Conquer techniques to design the algorithms and apply these methods in designing algorithms to solve a given problem.
3. Explain the Decrease and Conquer, Transform and Conquer algorithm design techniques, and Time versus Space Trade-offs.
4. Get the idea of Greedy method and dynamic programming methods and apply these methods in designing algorithms to solve a given problem.
5. Describe and illustrate the idea of Backtracking and Branch and Bound algorithm design techniques to solve a given problem.

UNIT – I	**Contact Hours**
Introduction: What is an Algorithm? Fundamentals of Algorithmic Problem Solving **(Text Book-1: Chapter 1: 1.1 to 1.2)** **Fundamentals Of The Algorithms Efficiency:** Analysis Framework, Asymptotic Notations and Standard notations and common functions Mathematical Analysis of Non-recursive and Recursive Algorithms, **(Text Book-1: Chapter 2: 2.1 to 2.4)** **Brute Force:**Background, Selection Sort, Brute-Force String Matching. **(Text Book-1: Chapter 3: 3.1, 3.2)** **Divide And Conquer:**Merge sort, Quick sort, Binary Search **(Text Book-1: Chapter 4: 4.1 to 4.3)**	15
UNIT – II	
Decrease & Conquer: General method, Insertion Sort, Topological Sorting **Transform And Conquer:**General method, Balanced Search Trees, Heaps and Heap sort. **Time And Space Tradeoffs:** Input Enhancement in String Matching: Horspool's algorithm **(TextBook-1: Chapter 5: 5.1, 5.3, Chapter 6: 6.3 to 6.4, Chapter 7: 7.2)** **Dynamic Programming:** General method, The Floyd-Warshall Algorithm, The Knapsack problem **(Textbook-1: Chapter 8: 8.2).**	15

UNIT – III	
Greedy Technique: General method of Greedy technique, Single-Source Shortest Paths: General method, The Bellman-Ford algorithm, Single-Source Shortest Paths in DAGs, Dijkstra's Algorithm **(Textbook-2: Chapter 24: 24.1 to 24.3).** Minimum Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Optimal Tree problem: Huffman Trees **(Textbook-1: Chapter 9: 9.1, 9.2, 9.4).** **Backtracking:**General method, N-Queens problem, Subset-sum problem. **(Textbook-1: Chapter 12: 12.1)** **Branch And Bound:**General method, Assignment Problem, Travelling Salesman problem, Knapsack Problem, **(Textbook-1: Chapter 12: 12.2)**	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. **Explain** the algorithmic problem solving, algorithm design techniques and standard Asymptotic notations. **Apply** the general procedure of non-recursive and/or recursive algorithms to obtain worst-case running times of algorithms using asymptotic analysis.
2. **Interpret** the brute-force, divide-and-conquer paradigms and explain when an algorithmic design situation calls for it. **Relate** algorithms that employ these paradigms. **Develop** and implement an algorithm to demonstrate its performance using these paradigms. For the given algorithm, develop the recurrence; **Analyze** and **Simplify** the recurrence to obtain the performance of divide-and-conquer algorithm.
3. **Explain** the Decrease and Conquer, Transform and Conquer algorithm design paradigms, string matching algorithms and hashing concepts. **Develop** and implement an algorithm and demonstrate its performance using these paradigms.
4. **Identify** and **explain** the greedy technique and dynamic-programming paradigm as to when an algorithmic design situation calls for it. **Relate** algorithms that employ these paradigms. **Develop** and implement an algorithm and demonstrate its performance using these paradigms. **Discover** the shortest-path and minimum spanning tree problems by assuming shortest-paths algorithms and minimum spanning tree algorithms respectively.
5. **Describe** the Backtracking, Branch and Bound algorithm design paradigms and explain when an algorithmic design situation calls for it. **Relate** algorithms that employ these paradigms. **Develop** and implement an algorithm and demonstrate its performance using these paradigms. **Explain** the limitations of algorithmic power.

TEXTBOOKS:

1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", 2nd Edition, Pearson Education, 2011.
2. Thomas H. Cormen, Charles E.Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, PHI, 2014.

REFERENCEBOOKS:

1. Horowitz E., Sahni S., Rajasekaran S, "Computer Algorithms", Galgotia Publications, 2001.
2. R.C.T. Lee, S.S. Tseng, R.C. Chang &Y.T.Tsai, "Introduction to the Design and Analysis of Algorithms A Strategic Approach", Tata McGraw Hill, 2005.

E-Books / NPTEL/MOOCs:

1. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html
2. http://nptel.ac.in/courses/106101060/
3. https://www.coursera.org/specializations/algorithms

List of Experiments:

Students have to write, execute and test programs covering the syllabus of 20AM402.
Typical problems that may be tried are

1. Various Sorting/Searching algorithms
2. Graph traversals – DFS and BFS, Connectivity and Reachability of graphs
3. Topological Sorting
4. Descending Priority Queue using Heap
5. Horspool string matching algorithm
6. Using Dynamic Programming and by using memory functions.
    a. Binomial coefficient
    b. Warshall's algorithm
    c. Floyd's algorithm
    d. Knapsack problem
7. Prim's algorithm
8. Kruskal's algorithm
9. Dijkstra's algorithm
10. N-Queens problem.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Formulate, design and develop Brute force and Divide & Conquer Techniques for complex engineering problems using appropriate modern engineering and IT tools.
2. Formulate, design and develop Decrease & conquer and transform & Conquer Techniques for complex engineering problems using appropriate modern engineering and IT tools.
3. Formulate, design and develop space-time trade off and dynamic programming Techniques for complex engineering problems using appropriate modern engineering and IT tools.
4. Formulate, design and develop greedy Techniques for complex engineering problems using appropriate modern engineering and IT tools.
5. Formulate, design and develop Backtracking and Branch and Bound Techniques for complex engineering problems using appropriate modern engineering and IT tools.

Table 1: Mapping Levels of COs to POs / PSOs														
COs	**Program Outcomes (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2	3												2
CO2	2	2	3	2	3				1			1		3
CO3	2	3		2	3				1			1		3
CO4	2	2	3	2	3				1			1		3
CO5	2	3		2	3									

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course Outcomes (COs)	**Program Outcomes (POs) Addressed**	**Performance Indicators (PI)**	**Bloom's Taxonomy Level (BTL)**
CO1	1,2	1.1.1, 2.1.3, 2.2.3	L3
CO2	1,2,3 4,5	1.4.1, 2.1.3, 2.2.3, 2.3.1, 3.2.1, 9.2.1 4.1.2, 4.3.3, 5.2.2	L4
CO3	1,2 4,5	1.4.1, 2.1.3, 2.2.3, 2.3.1 4.1.2, 5.2.2	L3
CO4	1,2,3 4,5	1.4.1, 2.1.3, 2.2.3, 2.3.1, 3.2.1 4.1.2, 5.2.2	L4
CO5	1,2 4,5	1.4.1, 2.1.3, 2.2.3, 2.3.2 4.1.2, 5.2.2	L3

DATABASE SYSTEMS

Course Code	**21AM403**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**39 + 26**	**Exam Hours**	**03**

Credits – 4

Course Learning Objectives:

This Course will enable students to:

1. Provide a strong foundation in database concepts, design and application.
2. Understand the concepts of relational model and relational algebra in database design.
3. Learn structured query language (SQL) to an intermediate/advanced level and evaluate the result set.
4. Understand the use of normalization techniques for building effective database design.
5. Demonstrate the use of transactions in databases

UNIT - I	Contact Hours
Databases and Database Users Introduction, An Example, Characteristics of the database approach, Actors on the scene, Workers behind the scenes. **Database System Concepts and Architecture** Data models, Schemas and Instances, Three-Schema Architecture and data Independence, Database languages and interfaces. **Data Modeling Using the Entity–Relationship (ER) Model** Entity Types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues. **The Relational Data Model and Relational Database Constraints** Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, transactions, and dealing with constraint violations. **The Relational Algebra and Relational Calculus** Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory. Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations; Examples of Queries in Relational Algebra. (T1: 1.1, 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 3.3-3.7, 5.1-5.3, 8.1-8.5)	15 Hours
UNIT – II	
Relational Database Design by ER- and EER-to-Relational Mapping: Relational Database Design Using ER- to-Relational Mapping. 16 Hours Basic SQL: SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic retrieval queries in SQL, Insert, Delete and Update Statements in SQL, Additional features of SQL.	15

More SQL: Complex Queries, Triggers, Views, and Schema Modification: More complex SQL retrieval queries, Specifying constraints as assertions and actions as triggers, Views in SQL, Schema Change Statements in SQL. **Introduction to SQL Programming Techniques:** Database Stored Procedures and SQL/PSM. **Basics of Functional Dependencies and Normalization for Relational Databases:** Informal design guidelines for relation schemas, Functional Dependencies, Normal Forms Based on Primary Keys, general definitions of Second and Third Normal Forms. (T1: 9.1, 6.1-6.5, 7.1-7.4, 10.4, 14.1-14.4)	
UNIT – III	
Basics of Functional Dependencies and Normalization for Relational Databases: Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. 08 Hours **Relational Database Design Algorithms and Further Dependencies**: Inference Rules, Equivalence, and Minimal cover. **Introduction to Transaction Processing Concepts and Theory:** Introduction to transaction processing, desirable properties of transactions, characterizing schedules based on Serializability. **Concurrency Control Techniques:** Two-phase locking techniques for concurrency control. (T1:14.5 -14.7, 15.1, 20.1, 20.3, 20.5, 21.1)	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Illustrate the concepts of database objects for the given problem.
2. Identify and enforce integrity constraints on a database using RDBMS.
3. Apply structured query language for (SQL) for database manipulation.
4. Model normalized database structures by creating simple database systems.
5. Illustrate the concepts of transactions in databases.

TEXTBOOK:

1. Database Systems Models, Languages, Design and Application Programming, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.

REFERENCEBOOKS:

1. Database System Concepts, SilberschatzKorth and Sudharshan, 6th Edition, McGraw Hill, 2013.
2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, Third Edition, McGraw-Hill,2003.
3. C.J. Date, A. Kannan, S. Swamynatham: “An Introduction to Database Systems”, Eight Edition, Pearson Education,2006.
4. P.J.Sadalage and M. Fowler,"No SQL Distilled: A Brief Guide on the Emerging World of Polyglot Persistence“, Pearson Education, Inc. 2012.
5. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, First Edition, Wiley,2015.

List of Experiments

Students have to write, execute and test programs covering the syllabus of 20AM403.

Typical problems that may be tried are

1. Familiarize with Visual Basic: Develop an application to accept a string and convert the case of the character using VB .Net.
2. Familiarize with Visual Basic: Develop a program to implement a Calculator using VB.
3. Familiarize with SQL Plus: Demonstrate Create tables and insert values using SQL.
4. Familiarize with SQL Plus: Manipulate data and schema of the table.
5. Demonstrate SQL DDL Statements (drop, Alter) and DML statements (update, delete) for given data.
6. Familiarize with Queries: Demonstrate WHERE, LIKE, ORDER BY with simple database.
7. With a given database demonstrate the queries using UNION, INTERSECT, IN, NOT IN, EXISTS, NOT EXISTS clause.
8. Create a database and implement the concept of Group By and Having clause.
9. Implementation of a mini project that involves a user interface design, database design and design of SQL queries to suit the need of the designed application.

E-Books / Online Resources/MOOCs:

1. https://nptel.ac.in/courses/106105175
2. https://www.coursera.org/specializations/database-systems

Table 1: Course Outcomes (CO) Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
CO1	2									1		1		
CO2	2	2								1		1		
CO3	2	3								1		1		3
CO4	2	2	3							1		1		2
CO5	2									1		1		2

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,10,12		L3
CO2	1,2		L2
CO3	1,2		L2
CO4	1,2,3,10		L4
CO5	1,10		L4

DATABASE SYSTEMS LAB

Course Code	**21AM403**	**CIE Marks**	**50**
Number of Contact Hours/Week	**0:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**26**	**Exam Hours**	**03**

Credits – 1

Course Learning Objectives:

This course will enable students to:

1. Implement and evaluate programs in VB programming language.
2. Demonstrate tables using SQL Plus.
3. Implement SQL queries.
4. Apply the knowledge of database design and carry out a mini project.

List of Experiments

Students have to write, execute and test programs covering the syllabus of 20AM403.

Typical problems that may be tried are

1. Familiarize with Visual Basic: Develop an application to accept a string and convert the case of the character using VB .Net.
2. Familiarize with Visual Basic: Develop a program to implement a Calculator using VB.
3. Familiarize with SQL Plus: Demonstrate Create tables and insert values using SQL.
4. Familiarize with SQL Plus: Manipulate data and schema of the table.
5. Demonstrate SQL DDL Statements (drop, Alter) and DML statements (update, delete) for given data.
6. Familiarize with Queries: Demonstrate WHERE, LIKE, ORDER BY with simple database.
7. With a given database demonstrate the queries using UNION, INTERSECT, IN, NOT IN, EXISTS, NOT EXISTS clause.
8. Create a database and implement the concept of Group By and Having clause.
9. Implementation of a mini project that involves a user interface design, database design and design of SQL queries to suit the need of the designed application.

Course Outcomes:

Upon completion of this course, students will be able to:

1. Design and implement a database schema for a given problem- domain, including the E-R method and normalization approach by applying knowledge of databases, analyse engineering problem, ethical principles, teamwork, communication, and lifelong learning.
2. Implement a database using SQL DML/DDL commands and enforce integrity constraints on a database to meet the specified needs.
3. Construct queries using SQL to solve the problems by analyzing and interpreting data and communicate effectively on complex engineering activities.
4. Design and build a GUI application and connecting it to database and apply contextual

knowledge to assess societal, legal and consequent responsibilities relevant to the professional engineering practice. 5. Applying the concept of Transaction and Query processing effectively with to solve the problems and also team member should have Professional and ethical responsibilities.	

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	2	3											3
CO2	2	3												3
CO3	2	3												3
CO4	1	2	3											3
CO5	1	2												3

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2,3	1.2.1, 1.3.1, 2.1.3, 3.1.2	L2, L3
CO2	1,2	1.4.1, 2.1.2, 2.3.1	L2, L3, L4
CO3	1,2	1.4.1, 2.1.3, 2.3.2	L2, L3, L4
CO4	1,2,3	1.4.1, 2.1.3, 2.3.2, 3.2.2	L2, L3, L4
CO5	1,2	1.4.1, 2.3.1	L2, L3

ADVANCED MACHINE LEARNING

Course Code	**21AM404**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:0**	**SEE Marks**	**50**
Total Number of Contact Hours	**39**	**Exam Hours**	**03**

Credits – 3

Course Learning Objectives:

1. To help students understand basic mathematical and statistical techniques commonly used in pattern recognition.
2. Outline the students about feature selection and extraction methodologies
3. To introduce students to basics of Genetic algorithms
4. To introduce students to various soft clustering algorithms
5. Describe the concept of visual recognition.

UNIT - I	**Contact Hours**
Introduction: Is pattern Recognition Important? Basics of linear algebra and vector spaces, Eigen values and eigen vectors, Rank of matrix and SVD. **Probability Theory:** Probability densities, Expectations and covariances, The Gaussian distribution; The Exponential Family; **Types of Data:** Features and patterns; Domain of a variable, Types of Features, Proximity measures; **Data Pre-processing:** Outlier removal, data normalization, missing data, ROC, class separability measures; **Feature Extraction and Feature Selection:** Types of Feature Selection, Mutual Information for Feature Selection, Chi-square statistics, Goodman–Kruskal Measure, Laplacian Score, Singular Value Decomposition (SVD), Non-negative Matrix Factorization, Non-linear dimensionality reduction (PCA), Random Projections (RPs) for Feature Extraction, Locality Sensitive Hashing (LSH) , Class Separability, Genetic and Evolutionary Algorithms, Ranking for Feature Selection, Feature Selection for Time Series Data;	15
UNIT – II	
Classification using Soft Computing Techniques: Introduction, Fuzzy classification: Fuzzy *k*-nearest neighbour algorithm **GAs:**What is Genetic Algorithm? Conventional Optimization and Search Techniques, A Simple Genetic Algorithm, Comparison of Genetic Algorithm with Other Optimization Techniques, Advantages and Limitations of Genetic Algorithm, Applications of Genetic Algorithm, Terminologies and Operators of GA. **Soft Clustering:** Why Clustering? Soft Clustering Paradigms, Fuzzy Clustering: Fuzzy *K*-means algorithm, Rough Clustering, Clustering Based on Evolutionary Algorithms, Clustering Based on Neural Networks, Statistical Clustering: OKM algorithm, EM-based clustering;	15

UNIT - III

Visual Recognition: Recognition methods: Low-level modelling (e.g. features), Midlevel abstraction (e.g. segmentation), High-level reasoning (e.g. scene understanding); Detection/Segmentation methods; Applications: Shot boundary detection, Finding skin using image colour.	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Understand basic mathematical and statistical techniques commonly used in pattern recognition.
2. Understand the process of feature extraction and selection
3. Understand the basics of genetic algorithms and its applications.
4. Understand and apply soft clustering techniques
5. Apply different types of visual recognition algorithms.

TEXTBOOKS:

1. Introduction to machine learning and pattern recognition, M NarashimaMoorthi and Der V Susheela Devi, 2019.
2. Introduction to genetic algorithms,S. N. Sivanandam · S. N. Deepa -2007.
3. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2006.

REFERENCEBOOKS:

1. Pattern Classification by Richard O. Duda, Peter E. Hart, David G. Stork, Wiley, 1973.

E Books / MOOCs/ NPTEL:

https://nptel.ac.in/courses/106/106/106106046/
https://nptel.ac.in/courses/106106046 - NPTEL, principles of pattern recognition

Table 1: Mapping Levels of COs to POs
1: Low, 2: Medium, 3: High

COs	Program Objectives (POs)												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	2			2								2	
CO2	3	2			2								2	
CO3	3	2			2								2	
CO4	3	2			2								2	
CO5	3	3			3								2	

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3, 5.1.1	L3
CO2	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO3	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO4	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1	L3
CO5	PO1, PO2, PO5	1.3.1,1.4.1, 2.1.2, 3.1.1,3.1.2,3.1.3,5.1.1, 5.3.1	L3

INTRODUCTION TO DATA SCIENCE AND R PROGRAMMING

Course Code	**21AM405**	**CIE Marks**	**50**
Number of Contact Hours/Week	**3:0:0**	**SEE Marks**	**50**
Total Number of Contact Hours	**39**	**Exam Hours**	**03**

Credits – 3

Course Learning Objectives:

This course will enable students to:

1. Explain the concepts of data mining and types of Analytics.
2. Illustrate the use of Data validation and Data Visualization
3. Get the idea of lookup functions and Pivot Tables
4. Describe the basic concepts of R programming
5. Apply the Data visualization concepts using R programs

UNIT - I	Contact Hours
Introduction to Data Science: Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields **Introduction to Data Mining**: What is data mining, Challenges, Data Mining Tasks, Phases of datamining Benefits of data mining,What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Major Issues in Data Mining, PREPROCESSING: Data Quality, Major Tasks in Data Pre-processing, Data Reduction, Data Transformation and Data Discretization, Data Cleaning and Data Integration. **Data Warehousing and online analytical processing:** Data Warehouse basic concepts, Data Warehouse Modelling - Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation. **Classification:** Decision Trees Induction, Rule Based Classifiers, Nearest Neighbour Classifiers, Bayesian Classifiers. K-Means**.,** Regression Model, Apriori Algorithm in datamining	15

UNIT – II	
R Programming Basics: Overview of R programming, Environment setup with R Studio, R Commands, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions. **Data Visualization using R:** Reading and getting data into R (External Data): Using CSV files, Excel files. **Working with R Charts and Graphs:** Histograms, Box plots, Bar Charts, Line Graphs, Scatter plots, Pie Charts.	15

UNIT – III	
Introduction to Data Analysis using Excel: Introduction to Data Mining, Business Intelligence, Statistical Analysis, Predictive Analytics, Text Analytics, **Data Analysis Process:** Excel Formulas and Functions — Learn with Basic Examples, Logical Functions in Excel — IF, AND, OR, Nested IF and NOT. Conditional Formatting, Sorting and Filtering, Subtotals with Ranges. **Data Quick Analysis:** Understanding Lookup Functions, PivotTables, Data Visualization, Data Validation. What-If Analysis, Importing Data into Excel, Data Model, Exploring Data with PivotTable	9

Course Outcomes:

Upon completion of this course, students will be able to:

1. Apply the Concepts of data science in various fields
2. Study different data mining algorithm
3. Describe R basics, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors,
4. Analysis the data using different R graphs and Charts.
5. Acquire the knowledge of data analysis and carry out the data analysis process.

TEXTBOOKS:

1. Microsoft Excel 2019 Data Analysis and Business Modelling (Business Skills), 6th Edition, Wayne L Winston, ISBN-13: 978-1509305889, ISBN-10: 1509305882.
2. Tilman M. Davies, “The Book of R: A First Course in Programming and Statistics”, No Starch Press; 1st edition,2016.
3. Jiawei Han, Micheline Kamber, Jian Pei (2012), Data Mining: Concepts and Techniques, 3rdedition, Elsevier, UNITed States of America.

REFERENCEBOOKS:

1. Paul Mc Fedries. Microsoft Excel 2019 Formulas and Functions (Business Skills), 1st Edition, ISBN-13: 978-1509306190, ISBN-10: 1509306196.
2. Gil Raviv, Collect, Combine, and Transform Data Using Power Query in Excel and Power BI (Business Skills) 1st Edition, ISBN-13: 978-1509307951, ISBN-10: 1509307958.
3. Devin Knight, Mitchell Pearson, Bradley Schacht, Erin Ostrowsky, Microsoft Power BI Quick Start Guide: Bring your data to life through data modelling, visualization, digital storytelling, and more, 2nd Edition, ISBN-13: 978-1800561571, ISBN-10: 1800561571
4. Andrie de Vries and Joris Meys, R for Dummies, 2nd Edition, John Wiley & Sons’ 2nd edition, 2015.
5. Hadley Wickham, Garrett Grolemund, R for data Science: Import, Tidy, Transform, Visualize, And Model Data, O′Reilly; 1st edition, 2017.
6. Andrew Oleksy, Data Science with R: A Step by Step Guide With Visual Illustrations & Examples,

E-Books / Online Resources/Moocs:

1. Excel Skills for Data Analytics and Visualization Specialization
   https://www.coursera.org/specializations/excel-data-analytics-visualization
2. IBM Data Analytics with Excel and R Professional Certificate
   https://www.coursera.org/professional-certificates/ibm-data-analyst-r-excel
3. Introduction to Data Analysis Using Excel
   https://www.coursera.org/learn/excel-data-analysis

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	1										3	
CO2	3	3	1										3	
CO3	3	3	1										3	
CO4	3	3			1								3	
CO5	3	3	1		1								3	

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	1,2	1.1.1,1.3.1, 1.4.1, 2.1.3	L3
CO2	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO3	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO4	1,2,5	1.3.1, 1.4.1, 2.1.3, 5.1.1	L2
CO5	1,2,4,5	1.3.1, 1.4.1, 2.1.2, 2.1.3, 2.4.1, 2.3.1, 2.4.1, 4.3.1, 4.3.3, 4.3.4, 5.1.1	L4

MACHINE LEARNING AND DATA SCIENCE LAB

Course Code	**21AM406**	**CIE Marks**	**50**
Number of Contact Hours/Week	**0:0:2**	**SEE Marks**	**50**
Total Number of Contact Hours	**26**	**Exam Hours**	**03**

Credits – 1

Course Learning Objectives:

This course will enable students to:

1. Apply the basics of Excel
2. Analysis the data using Pivot Tables and Lookup Values
3. Describe the basic concepts of R programming
4. Apply the Data visualization concepts using R programs
5. Explain the concepts of data mining and types of Analytics.

List of Experiments

Students must write, execute, and test programs covering the syllabus of 21AM404 and 21AM405.
Typical problems that may be tried are as follows:

Question 1

1. Create a worksheet with header SI. No, Date and Sales, Day, Month, Quatre Item Name, Item No, No of Items, Item Price
2. TAX (If ITEM PRICE is less than 100, TAX is 50, otherwise it should be 100).
3. TOTAL PRICE BEFORE TAX =NO. OF ITEMS * ITEM PRICE.
4. TOTAL PRICE AFTER TAX = TOTAL PRICE BEFORE TAX + TAX.
5. RATE (If TOTAL PRICE AFTER TAX > 3500 then the rate is “HIGH”, otherwise it is REASONABLE.
6. Find Count of Items, Average of Taxes, Min Item PRICE and Max Item PRICE.
7. Find the total sales
8. Find the monthly sales
9. Find Quarterly sales
10. Find Weekly Sales
11. Draw bar chart to compare the sales (Monthly, Quarterly, Weekly)
12. Draw Pie chart to compare the sales (Monthly, Quarterly, Weekly)
13. Save file

Question 2

1. Create the worksheet with Sales No, City, Sales amount for the month of Jan, Feb, March
2. Set the Text alignment, Columns width and high appropriately.
3. Use AutoFill to put the Series Numbers into cells A5:A7.
4. Format cells C3:G7, C8:E11, C13:E13 to include dollar sign with two decimal places.
5. Find the Average Sales and Maximum Sales for each City.
6. Find the Total Sales for each Month.

7. Calculate the Profit for each month, where profit = Total Sales – Cost (Cost of Jan is $83,000,00, cost of Feb is $84,000,00 and cost of March is $43,000,00)
8. Calculate the 10% Bonus, which is 10% of the Profit.
9. Find the Total Sales for each Month; only for sales greater than 30,000.
10. Find the No of Sales for each Month; only for sales greater than 30,000.
11. Create the bar chart to compare the sales of Jan Feb and march
12. Create the pie chart to compare the sales of each city

Question3

1. Create a table with Header Name, Class, date of Birth and Marks of Six Subjects
2. Count the number of entries.
3. Count the entries starting with letter "A".
4. Count the entries born in 2005.
5. Count the blank entries in "Class"
6. Count the entries starting with letter "J" and born in 2007.
7. Find the maximum marks and minimum marks scored by each student.
8. Find the total marks of each student only if he/she has scored above 35 in all the subjects else print "FAIL".
9. Find the average of all the students who have passed in all the subjects else print "FAIL".
10. Display the Grades as follows:
11. If Average >= 85, Grade is Distinction
    If Average >= 60, Grade is First Class
    If Average >= 45, Grade is Second Class
    If Average >= 35, Grade is Third Class
    Otherwise Fail.
12. Find the average pass score of Class 8, Class 9 and Class 10 Students.

Question 4

1. Create a Sales details table consists of Employee Name, Salary, Revenue Generated by employee, Date of Birth, Address.
2. Calculate Annual Increment using following table
    1. If Age is between 50 and 58 and Revenue generated is 50000 30% increment
    2. If Age is between 50 and 58 and Revenue generated is 100000 10% increment
    3. If Age is between 40 and 50 and Revenue generated is 50000 30% increment
    4. If Age is between 40 and 50 and Revenue generated is 100000 10% increment
    5. If Age is between 30 and 40 and Revenue generated is 50000 30% increment
    6. If Age is between 30 and 40 and Revenue generated is 100000 10% increment
    7. If Age is between 25 and 30 and Revenue generated is 30000 30% increment
    8. If Age is between 25 and 30 and Revenue generated is 50000 10% increment
3. Calculate total Revenue
4. Create a pivot table to calculate total revenue of each salesperson
5. Create bar chart to represent these details.
6. Calculate the Number of Employees coming from same state.
7. Calculate the age and classify them based on the following table
    a.a) if age is between 21- 40 classify as young
    b. b) if age is between 45 - 60 classify as middle age

c.c) if age is above 60 classify as old age.

8. Draw bar chart to compare the ages.

Question 5

1. Create a table to enter a Details of a Students. You Should include Name DOB, Marks, and Class
2. Find the total
3. Find the Average and Use ROUNDUP function for rounding off the values
4. Find the Maximum and Minimum Score of Each Students
5. Find the total Number of students in the class
6. Find the Age by using DOB
7. Use VLOOKUP function and Display the details of a Student
8. Draw Bar graph to compare the performance of the students in each Subject

Question 6

1. Create Institute table consists of Employee Name, Employee Id (Should be generated automatically) Department, Basic salary/Month, Allowance, DOB (At least 50 Data Should be entered)
2. Calculate the total Number of Employees in the Institute
3. Calculate total number of Employees in each Department.
4. Calculate Gross salary by summing up salaries and Allowance
5. Find the tax by using Following table
6. IF annual Income is greater than 500000, tax = 10 % of basic Salary
7. IF annual Income is greater than 750000, tax = 20 % of basic Salary
8. IF annual Income is greater than 1000000, tax = 30 % of basic Salary
   No tax for salary less than 500000
9. Find net Salary of an employee. Net_Salary = Gross_salary – Tax
10. Find the Age of each Employee
11. Find the department having most number of employees and least number of employees
12. Find the Average salary of employees working for Computer Science Department
13. Find the total salary of employees working for Civil Department.
14. Insert USN and Name as Header and Date as Footer
15. Display the Details of employee of each department (Employee Details should consist Employee Name, id, Age and Net Salary)
16. Use Conditional Formatting to highlight the Department Having Maximum Number of Employees and Also highlight highest paid top 10 employees

R Programming

1. Write a R program to find the largest of three numbers.
2. Write a R program to find the Roots of a quadratic equation
3. Write a R program to check the entered number is prime number or not
4. Write a R program to define the Function which will print the factors of a given number.
5. Write a R program to Enter the student details (Name, Rollo and three marks) and find the average and display the grade according to following table
   If Students Scores less than 35 in any subjects, then student is Fail
   if Average >= 85 then grade =Distinction

If Average l >=60 and total<85, then grade = First Class
If Average>= 50 and total < 65 then grade = Second Class
If Average >= 40 and total< 40 then grade =Third Class
Else Pass

6. Write R program to print the Fibonacci series of a entered number.

PART B

1. Load MNIST & IRIS dataset and visualize the various properties of the datasets.
2. Implement an algorithm to classify the given dataset and visualize its confusion matrix.
3. Implement and compare the performance of two classifiers on any dataset.
4. Implement data pre-processing steps and demonstrate its impact on classification.
5. Implement dimensionality reduction on any given dataset and demonstrate its influence on performance.
6. Demonstrate Mutual Information for feature selection
7. Implement any classification model and demonstrate k-fold cross validation.
8. Implement fuzzy KNN on any dataset and compare its performance with KNN algorithm
9. Identify the best model parameters for ANN model using GA algorithms
10. Demonstrate multi-label classification on a given dataset and visualize the decision boundaries.
11. Implement semi-supervised learning strategy for the task of classification on any given dataset.
12. Implement an outlier detection algorithm for the detection of anomalous patterns in time series data.
13. Demonstrate soft clustering algorithm on any given dataset and visualize clusters.
14. Develop a classification model to detect dogs and cat from a given dataset.

Mini project

Course Outcomes:

Upon completion of this course, students will be able to:

1. Acquire the knowledge of data analysis and carry out the data analysis process.
2. Practice out quick data analysis, extracting data values from text.
3. Demonstrate the export of data to excel, PivotTable
4. Describe R basics, Variables and Data Types, Control Structures, Array, Matrix, Vectors, Factors, Functions, and analysis the data using different R graphs and Charts.
5. Apply the concepts of Data science and study different data mining algorithms.

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3	3	1										3	
CO2	3	3	1										3	
CO3	3	3	1										3	
CO4	3	3			1								3	
CO5	3	3	1		1								3	

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,2	1.1.1,1.3.1, 1.4.1, 2.1.3	L3
CO2	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO3	1,2,4	1.1.1,1.3.1,1.4.1, 2.1.3, 2.3.1, 2.4.1, 4.3.1,4.3.3,4.3.4	L4
CO4	1,2,5	1.3.1, 1.4.1, 2.1.3, 5.1.1	L2
CO5	1,2,4,5	1.3.1, 1.4.1, 2.1.2, 2.1.3, 2.4.1, 2.3.1, 2.4.1, 4.3.1, 4.3.3, 4.3.4, 5.1.1	L4

SAMSKRUTIKA KANNADA

Course Code	**21HU312**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**(1:0:0:0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**15**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

ಸಾಂಸ್ಕೃತಿಕಕನ್ನಡಕಲಿಕೆಯಉದ್ದೇಶ:

- ಪದವಿವಿದ್ಯಾರ್ಥಿಗಳುಸಾಂಸ್ಕೃತಿಕಕನ್ನಡಮತ್ತುಕ್ರಿಯಾತ್ಮಕಕನ್ನಡವನ್ನುಕಲಿಯಬೇಕು
- ವಿದ್ಯಾರ್ಥಿಗಳುಕನ್ನಡಶಬ್ದಕೋಶಮತ್ತುಕನ್ನಡಭಾಷೆಯನಿಯಮಗಳನ್ನುಕಲಿಯಬೇಕು
- ಕನ್ನಡಭಾಷೆಯದೋಷಗಳುಮತ್ತುಅದರತಿದ್ದುಪಡಿ
- ಸಾಮಾನ್ಯಅರ್ಜಿಮತ್ತುಸರ್ಕಾರಿಪತ್ರಗಳಅರಿವು
- ಭಾಷಾಂತರಮತ್ತುಪ್ರಬಂಧಬರವಣಿಗೆಯಲ್ಲಿಆಸಕ್ತಿ

UNIT – I

ಕನ್ನಡನಾಡುನುಡಿಮತ್ತುಸಾಂಸ್ಕೃತಿಕಸಂಬಂಧಿಸಿದಲೇಖನಗಳು
೧. ಕರ್ನಾಟಕಸಂಸ್ಕೃತಿ :ಹಂಪೆನಾಗರಾಜಯ್ಯ
೨ಕರ್ನಾಟಕಏಕೀಕರಣ: ಒಂದುಅಪೂರ್ವಚರಿತ್ರೆ-ಜಿವೆಂಕಟಸುಬ್ಬಯ್ಯ
೩ಕನ್ನಡಆಡಳಿತಭಾಷೆಯಾಗಿ

UNIT – II

ಕಾವ್ಯಭಾಗ (ಆದುನಿಕಪರ್ವ)
೧. ವಚನಗಳು:ಬಸವಣ್ಣ ,ಅಕ್ಕಮಹಾದೇವಿಅಲ್ಲಯ್ಯಕ್ಕಿಮಾರಯ್ಯ
೨. ಕೀರ್ತನೆಗಳು :ಅದರಿಂದಏನುಫಲಇದರಿಂದಏನುಫಲ- ಪುರಂದರದಾಸ
೩. ತತ್ವಪದಗಳು: ಸವೀರಕೊಡಗಳಸುಟ್ಟು - ಶಿಶುನಾಳಷರೀಫ್
೪. ಜಾನಪದಗೀತೆ : ಬೀಸುವಪದ, ಬಡವರಿಗೆಸಾವಕೊಡಬೇಡ

UNIT – III

ಕಾವ್ಯಭಾಗ (ಆದುನಿಕ)
೧. ಮಂಕುತಿಮ್ಮನಕಗ್ಗ -ಡಿ.ವಿ. ಜಿ
೨ಕುರುಡುಕಾಂಚಾಣ- ದರಾಬೇಂದ್ರೆ
೩. ಹೊಸಬಾಳಿನಗೀತೆ - ಕುವೆಂಪು
೪. ಹೆಂಡತಿಯಕಾಗದ - ಕೆ. ಎಸ್ . ನರಸಿಂಹಸ್ವಾಮಿ
೫. ಮಬ್ಬಿನಿಂದಮಬ್ಬಿಗೆ - ಜಿ. ಎಸ್. ಶಿವರುದ್ರಪ್ಪ
೬. ಆಮರಈಮರ: ಚಂದ್ರಶೇಖರ್ಕಂಬಾರ
೭. ಚೋಮನಮಕ್ಕಳಹಾಡು: ಸಿದ್ದಲಿಂಗಯ್ಯ

UNIT – IV

ತಾಂತ್ರಿಕವ್ಯಕ್ತಿಪರಿಚಯ, ಕಥೆಮತ್ತುಪ್ರವಾಸಕಥನ
೧. ಡಾ. ಸರ್ವಂವಿಶ್ವೇಶ್ವರಯ್ಯವ್ಯಕ್ತಿಮತ್ತುಐತಿಹ್ಯ : ಎಎಸ್ಮೂರ್ತಿರಾವ್
೨. ಯುಗಾದಿ : ವಸುದೇಂದ್ರ
೩. ಮೆಗಾನೆಎಂಬಗಿರಿಜನಪರ್ವತ - ಹೀ. ಚಿ. ಬೋರೆಲಿಂಗಯ್ಯ

UNIT – V

ವಿಜ್ಞಾನಮತ್ತುತಂತ್ರಜ್ಞಾನ
೧. ಕರಕುಶಲಕಲೆಗಳುಮತ್ತುಪರಂಪರೆಯವಿಜ್ಞಾನ- ಕರೀಗೌಡಬೀಚನಹಳ್ಳಿ
೨. 'ಕ' ಮತ್ತು 'ಬ' ಬರಹತಂತ್ರಾಂಶಗಳುಮತ್ತುಕನ್ನಡದಟೈಪಿಂಗ್
೩. ಕನ್ನಡ- ಕಂಪ್ಯೂಟರ್ಶಬ್ದಕೋಶ

Pedagogy	Chalk and talk method, Power Point Presentation

ಸಾಂಸ್ಕೃತಿಕಕನ್ನಡಕಲಿಕೆಯಫಲಿತಾಂಶಗಳು

1. ಕನ್ನಡ ಭಾಷೆಕನ್ನಡದಪರಿಚಯವಾಗುತ್ತದೆ
2. ವಿದ್ಯಾರ್ಥಿಗಳಿಲ್ಲಿಕನ್ನಡಭಾಷೆಯವ್ಯಾಕರಣದಬಗ್ಗೆಅರಿವುಮೂಡುತ್ತದೆ
3. ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಲೇಖನ ಚಿನ್ನೆಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
4. ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು , ಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡುತ್ತದೆ
5. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಭಂದ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.
6. ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳು ಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.

ಪರೀಕ್ಷೆಯ ವಿಧಾನ : ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ

- ಕಾಲೇಜು ಮಟ್ಟದಲ್ಲಿಯೇ ಆಂತರಿಕ ಪರೀಕ್ಷೆಯನ್ನು 50 ಅಂಕಗಳಿಗೆ ವಿಶ್ವವಿದ್ಯಾಲಯದ ನಿಯಮಗಳು ಮತ್ತು ನಿರ್ದೇಶನದಂತೆ ನಡೆಸತಕ್ಕದು.

ಪಠ್ಯಪುಸ್ತಕ : ಆಡಳಿತಕನ್ನಡಪಠ್ಯಪುಸ್ತಕ
ಸಂಪಾದಕರು
ಡಾ. ಎಲ್ . ತಿಮ್ಮೇಶ
ಪ್ರೊ. ವಿ . ಕೇಶವಮೂರ್ತಿ
ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ . ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ, ಬೆಳಗಾವಿ

Web links and Video Lectures (e-Resources):

- https://www.vtuloop.com/adalita-and-vyavaharika-kannada-vtunotes/

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- SAMSKUTIKA KANNADA
  https://www.youtube.com/channel/UCGnCvpuI9Zr4aptq134MRBQ

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BALAKE KANNADA
(Kannada for communication)

Course Code	**21HU312**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**(0:2:0:0)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**15**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course Learning Objectives:

- The course will enable the students to understand Kannada and communicate in Kannada language.

ಅಧ್ಯಾಯ – I	
Vyavaharika kannada – Parichaya (Introduction to Vyavaharika Kannada)	
Pedagogy	Chalk and talk method, Power Point Presentation
ಅಧ್ಯಾಯ – II	
Kannada Aksharamale haagu uchcharane (Kannada Alpabets and Pronunciation)	
Pedagogy	Chalk and talk method, Power Point Presentation
ಅಧ್ಯಾಯ – III	
Sambhashanegaagi Kannada Padagalu (Kannada Vocabulary for Communication)	
Pedagogy	Chalk and talk method, Power Point Presentation
ಅಧ್ಯಾಯ – IV	
Kannada Grammar in Conversations (Sambhashaneyalli Kannada Vyakarana)	
Pedagogy	Chalk and talk method, Power Point Presentation
ಅಧ್ಯಾಯ – V	
Activities in Kannada	
Pedagogy	Chalk and talk method, Power Point Presentation

ಬಳಕೆಕನ್ನಡಕಲಿಕೆಯಫಲಿತಾಂಶಗಳು • ಭಾಷೆಕನ್ನಡದಪರಿಚಯವಾಗುತ್ತದೆ • ವಿದ್ಯಾರ್ಥಿಗಳಿಲ್ಲಿಕನ್ನಡಭಾಷೆಯವ್ಯಾಕರಣದಬಗ್ಗೆಅರಿವುಮೂಡುತ್ತದೆ • ಕನ್ನಡಭಾಷಾರಚನೆಯಲ್ಲಿನನಿಯಮಗಳುಮತ್ತುಲೇಖನಚಿನ್ನೆಗಳುಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ. • ಸಾಮಾನ್ಯಅರ್ಜಿಗಳು , ಸರ್ಕಾರಿಪತ್ರವ್ಯವಹಾರದಬಗ್ಗೆಅರಿವುಮೂಡುತ್ತದೆ • ಭಾಷಾಂತರಮತ್ತುಪ್ರಭಂದರಚನೆಬಗ್ಗೆಆಸಕ್ತಿಮೂಡುತ್ತದೆ. ಕನ್ನಡಭಾಷಾಭ್ಯಾಸಮತ್ತುಸಾಮಾನ್ಯಕನ್ನಡಹಾಗೂಆಡಳಿತಕನ್ನಡದಪದಗಳುಪರಿಚಯಿಸಲ್ಪಡುತ್ತವೆ.
ಪರೀಕ್ಷೆಯ ವಿಧಾನ : ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ ಕಾಲೇಜು ಮಟ್ಟದಲ್ಲಿಯೇ ಆಂತರಿಕ ಪರೀಕ್ಷೆಯನ್ನು 50 ಅಂಕಗಳಿಗೆ ವಿಶ್ವವಿದ್ಯಾಲಯದ ನಿಯಮಗಳು ಮತ್ತು ನಿರ್ದೇಶನದಂತೆ ನಡೆಸತಕ್ಕದು.
ಪಠ್ಯ ಪುಸ್ತಕ : ವ್ಯಾವಹಾರಿಕ ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕ **ಸಂಪಾದಕರು** **ಡಾ. ಎಲ್ . ತಿಮ್ಮೇಶ** **ಪ್ರೊ. ವಿ . ಕೇಶವಮೂರ್ತಿ** **ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ . ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವ ವಿದ್ಯಾ ನಿಲಯ, ಬೆಳಗಾವಿ**
Web links and Video Lectures (e-Resources): https://www.vtuloop.com/adalita-and-vyavaharika-kannada-vtunotes/
Activity Based Learning (Suggested Activities in Class)/ Practical Based learning • https://www.youtube.com/watch?v=PoQ9m16d7QA

ABILITY ENHANCEMENT COURSES

C++ PROGRAMMING			
Course Code:	**21AM01**	**Course Type:**	**AEC**
Teaching Hours/Week (L: T: P: S):	**0:0:2:0**	**Credits:**	**01**
Total Teaching Hours:	**26**	**CIE + SEE Marks:**	**50+50**
Use C++ program to demonstrate the OOP concepts.			
1. Write a C ++ program to sort a given set of elements using bubble sort. 2. Write a C ++ program to print the all the prime numbers in the given range. 3. Write a C ++ program to find the roots of quadratic equation. 4. Write a C ++ program to reverse a given number without using built in function.			

5. Write a C ++ program to create a details of n students having roll no, name, marks of 3 subjects using structure and display the students with highest grade.
6. Write a C ++ program to create a student detail having name, roll no and 3 marks. Find the grades according to the following table.
   If total >= 95 then grade =O
   If total >=85 and total <95 then grade = A
   If total >= 75 and total < 85 then grade = A
   If total >= 65 and total < 75 then grade = B
   If total >= 55 and total < 65 then grade =C
   If total >= 35 and total < 55 then grade =D
   Else F
7. Write a C ++ program to create a details of n students having roll no, name, marks of 3 subjects using class and display the details of a students by the specified roll no.
8. Write a C ++ program to create a class called employee and enter the employee details having employee id, name, salary for an employee. Display the employee having highest salary.
9. Write a C++ program to multiply given two matrices.
10. **Mini Project.**

Course Outcomes: At the end of the course student will be able to

1. Introduce Object Oriented Programming concepts using the C++ language
2. Demonstrate an understanding of algorithms in the problem-solving process.
3. Identify the necessary properties of good problem-solving techniques.
4. Create and analyse algorithms for solving simple problems.
5. Use incremental program development to create, test, and debug algorithms for solving simple problems.

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2		2						1					2
CO2	2		2						1					2
CO3	2		2						1					2
CO4	2		2						1					2
CO5	2		2						1					2

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,3,9		L3
CO2	1,3,9		L3
CO3	1,3,9		L3
CO4	1,3,9		L3
CO5	1,3,9		L3

****

UNIX SHELLAND SYSTEM PROGRAMMING			
Course Code:	**21AMA41**	**Course Type:**	**AEC**
Teaching Hours/Week (L: T: P: S):	**0:0:2:0**	**Credits:**	**01**
Total Teaching Hours:	**26**	**CIE + SEE Marks:**	**50+50**

Course Learning Objectives:

1. Execute programs written in C under UNIX environment.
2. Demonstrate how to use the basic Bourne Shell commands like cat, grep, ls,more, ps, chmod etc.
3. Study about simple filters, grep and sed filters.

List of Experiments

1.	Basic Unix Commands, Simple Shell scripts 1. Illustrate the usage of unix commands and vi editor concept. 2. Implement a shell program to find and display largest and smallest of three numbers
2.	Simple Shell scripts/Command Substitution 1. Find the number n is divisible by m or not using shell script. Where m and n are supplied as command line argument or read from key board interactively 2. Plan and implement a shell program to search a pattern in a file that will take both pattern and file name from the command line arguments.
3.	File attributes/expr command demonstration 1. Design a shell program that takes two file names, checks the permissions for these files are identical and if they are identical, output the common permissions; otherwise output each file name followed by its permissions. 2. Implement a shell program to display the length of the name and also display first three characters and last three characters in the name in two different lines if the name contains at

	least 6 characters.
4.	Arithmetic operators/Command Substitution 1. Write a shell program to implement simple calculator operations. 2. Design a Shell Program that takes the any number of arguments and print them in same order and in reverse order with suitable messages.
5.	String handling operations/Command Substitution 1. For the given path names (ex a/b,a/b/c), design a shell script to create all the components in that path names as directories. 2. Develop a shell script that performs following string handling operations i) Calculate the length of the string ii) locate a position of a character in a string iii) extract last three characters from string
6.	Command Substitution 1. For every filename, check whether file exists in the current directory or not and then convert its name to uppercase only if a file with new name doesnt exist using shell script. 2. Execution of exercise Shell scripts
7.	Process 1. C program to do the following: Using fork( ) create a child process. The child process prints its own process-id and id of its parent and then exits. The parent process waits for its child to finish (by executing the wait( )) and prints its own process-id and the id of its child process and then exits. 2. C program that creates a child process to read commands from the standard input and execute them (a minimal implementation of a shell - like program). You can assume that no arguments will be passed to the commands to be executed.
8.	Signal 1. Write a C Program to register signal handler for SIGINT and when it receives the signal, the program should print some information about the origin of the signal. 2. Write a C program which illustrates sending signal from one process to another by using kill API. Also check if the program has permission to send the signal or not.
9.	Write a C Program to register signal handler for SIGSTOP.
10.	AWK scripts Write a C Program to handle user defined signals.
11.	AWK scripts Write a C Program to create a Daemon process.
12.	Miscellaneous Exercise of shell programs, C programs on processes and signals

Course Outcomes: At the end of the course student will be able to

1. Interpret Unix commands to get familiarized with Unix operating system.
2. Develop and implement shell script file using UNIX commands.
3. Apply the concept of file attributes and filters to understand about the file permissions and pattern matching.
4. Design and implement signal functions.
5. Develop and implement processes in the Unix environment.

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2		2									2		2
CO2	2		2									2		2
CO3	2		2									2		2
CO4	2		2									2		2
CO5	2		2									2		2

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,3,12		L2
CO2	1,3,12		L3
CO3	1,3,12		L3
CO4	1,3,12		L3
CO5	1,3,12		L3

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INTRODUCTION TO JAVA PROGRAMMING

Course Code:	**21AMA42**	**Course Type:**	**AEC**
Teaching Hours/Week (L: T: P: S):	**0:0:2:0**	**Credits:**	**01**
Total Teaching Hours:	**26**	**CIE + SEE Marks:**	**50+50**

Use java program to demonstrate the OOP concepts.

1. Demonstrate the file handling using Java.
2. Implement the java programs that uses the concepts of exception handling, multi-threading.
3. Developing of user interfaces using the JAVA FX.
4. Develop Java program to store and retrieve data from database.
5. Java programs to establish network connectivity
6. Demonstrate the web application development using servlets and JSP
7. Mini Project

Course Outcomes:

At the end of the course student will be able to

1. Develop classes and apply object-oriented features to solve real world problems.
2. Develop robust Java programs using exception handling features, implement multiple inheritance using interfaces and organize the application classes using packages.
3. Develop programs that can run concurrent tasks using multithreading and perform basic file operations.
4. Develop GUI applications using Java swings and manage various events generated by user interactions with the UI using event handling mechanisms.
5. Develop type independent classes using generics; Choose and apply the right data structure to manage collection of data using the collections framework.

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	2		3		3									3
CO2	2		3		3									3
CO3	2		3		3									3
CO4	2		3		3									3
CO5	2		3		3									3

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,3,5		L3
CO2	1,3,5		L3
CO3	1,3,5		L3
CO4	1,3,5		L3
CO5	1,3,5		L3

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PREPARING FOR INDUSTRY			
Course Code:	**21AMA43**	**Course Type:**	**AEC**
Teaching Hours/Week (L: T: P: S):	**0:0:2:0**	**Credits:**	**01**
Total Teaching Hours:	**26**	**CIE + SEE Marks:**	**50+50**

Course Learning Objectives:

1. To develop the students' logical thinking skills
2. To learn the strategies of solving quantitative ability problems
3. To enrich the verbal ability of the students
4. To enhance critical thinking and innovative skills

Expected Course Outcome:

1. Develop effective communication and presentation skills (spoken and written).
2. Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.
3. Develop all-round personalities with a mature outlook to function effectively in different circumstances.
4. Gain Emotional Insights to Understand and Implement Change
5. Implement Emotionally Intelligent Motivational Skills to Achieve Team Results

UNIT - I

Interview skills – Types of interview and Techniques to face remote interviews and Mock Interview Structured and unstructured interview orientation, closed questions and hypothetical questions, Interviewers' perspective, Questions to ask/not ask during an interview, Video	**3 hours**

interview¸ Recorded feedback, Phone interview preparation, Tips to customize preparation for personal interview, Practice rounds	
Resume skills – Resume Template and Use of power verbs and Types of resume and Customizing resume Structure of a standard resume, Content, color, font, Introduction to Power verbs and Write up, Quiz on types of resume, Frequent mistakes in customizing resume, Layout - Understanding different company's requirement, Digitizing career portfolio	**1 hours**
Emotional Intelligence - L1 – Transactional Analysis and Brain storming and Psychometric Analysis and Rebus Puzzles/Problem Solving Introduction, Contracting, ego states, Life positions, Individual Brainstorming, Group Brainstorming, Stepladder Technique, Brain writing, Crawford's Slip writing approach, Reverse brainstorming, Star bursting, Charlette procedure, Round robin brainstorming, Skill Test, Personality Test, More than one answer, Unique ways	**6 hours**
UNIT – II	
Quantitative Ability-L3 – Permutation- Combinations and Probability and Geometry and mensuration and Trigonometry and Logarithms and Functions and Quadratic Equations and Set Theory Counting, Grouping, Linear Arrangement, Circular Arrangements, Conditional Probability, Independent and Dependent Events, Properties of Polygon, 2D & 3D Figures, Area & Volumes, Heights and distances, Simple trigonometric functions, Introduction to logarithms, Basic rules of logarithms, Introduction to functions, Basic rules of functions, Understanding Quadratic Equations, Rules & probabilities of Quadratic Equations, Basic concepts of Venn Diagram	**10 hours**
UNIT – III	
Reasoning ability-L3 – Logical reasoning and Data Analysis and Interpretation Syllogisms, Binary logic, Sequential output tracing, Crypto arithmetic, Data Sufficiency, Data interpretation-Advanced, Interpretation tables, pie charts & bar chats	**3 hours**
Verbal Ability-L3 – Comprehension and Logic ing comprehension, Para Jumbles, Critical Reasoning (a) Premise and Conclusion, (b) Assumption & Inference, (c) Strengthening & Weakening an Argument	**3 hours**

REFERENCEBOOKS:

1. Michael Farra and JIST Editors (2011) Quick Resume & Cover Letter Book: Write and Use an Effective Resume in Just One Day. Saint Paul, Minnesota. Jist Works
2. Daniel FlagePh.D(2003) The Art of Questioning: An Introduction to Critical Thinking. London. Pearson
3. David Allen (2002) Getting Things done: The Art of Stress -Free productivity. New York City. Penguin Books.
4. FACE (2016) Aptipedia Aptitude Encyclopedia.Delhi. Wiley publications
5. ETHNUS (2013) Aptimithra. Bangalore. McGraw-Hill Education Pvt. Ltd.

E-Books / Online Resources/Moocs:

1. www.chalkstreet.com
2. www.skillsyouneed.com
3. www.mindtools.com
4. www.thebalance.com
5. www.eguru.ooo

Mode of Evaluation: FAT, Assignments, Projects, Case studies, Role plays, 3 Assessments with Term End FAT (Computer Based Test)

Table 1: Mapping Levels of COs to POs

COs	Program Objectives (POs)												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						1		2	1	2	2	1		
CO2						1		2	1	2	2	1		
CO3						1		2	1	2	2	1		
CO4						1		2	1	2	2	1		
CO5						1		2	1	2	2	1		

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL

Course outcomes	Program Outcomes	Performance Indicators	Bloom's Taxonomy Level
CO1	6,8,9,10,11,12		L2
CO2	6,8,9,10,11,12		L2
CO3	6,8,9,10,11,12		L2
CO4	6,8,9,10,11,12		L2
CO5	6,8,9,10,11,12		L2

PRINCIPLES AND PRACTICES OF SOFTWARE ENGINEERING

Course Code	**21AMA44**	**CIE Marks**	**50**
Number of Contact Hours/Week	**1:0:0**	**SEE Marks**	**50**
Total Number of Contact Hours	**15**	**Exam Hours**	**03**

Credits – 1

Course Learning Objectives:

This Course will enable students to:

1. Outline software engineering principles and activities involved in building large software programs.
2. Explain the importance of architectural decisions in designing the software.
3. Describe the process of Agile project development.
4. Recognize the importance of software testing and describe the intricacies involved in software evolution.
5. Identify several project planning and estimation techniques and explain the importance of software quality.

UNIT – I	**Contact Hours**
Introduction: Professional Software Development, Software Engineering Ethics. **Software Processes:** Models: Waterfall Model, Incremental Model and Spiral Model; Process activities. **Requirements Engineering:** Functional and non-functional requirements, Requirements engineering processes, Requirements Elicitation and Analysis, Requirements specification, Software requirements document, Requirements validation & management.	5

UNIT – II

System Models: Context models, Interaction models, Structural models, Behavioural models, Model Driven Engineering **Architectural Design:** Architectural design decisions. Architectural Views and patterns, Application architectures. **Design and implementation:** Object oriented Design using UML. **Agile Software Development:**	5

Agile methods, Plan-driven and agile development, Extreme Programming, Agile project management.	
UNIT - III	
Project Management: Risk management, Managing People, Teamwork. **Project Planning:** Software pricing, Plan-driven development, Project Scheduling, Agile Planning, Estimation Techniques	5

Course Outcomes:

Upon completion of this course, students will be able to:

1. Recognise the basics of software system, component, process and Software Requirement Specification to meet desired needs within realistic constraints and outline the professional and ethical responsibility.
2. Describe the waterfall, incremental and iterative models and architectural design in implementing the software.
3. Make use of the techniques, skills, modern engineering design tools and agile methods necessary for engineering practice.
4. Describe the methods for maintaining software system.
5. Discuss project planning and management and illustrate the quality of software products.

TEXTBOOK:

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education, 2012.

REFERENCEBOOKS:

1. Roger S. Pressman: "Software Engineering-A Practitioners approach", 7th Edition, Tata McGraw Hill, 2017.
2. Pankaj Jalote: "An Integrated Approach to Software Engineering", Wiley, India, 2010.

E-Books / Online Resources/Moocs:

1. http://agilemanifesto.org/
2. http://www.jamesshore.com/Agile-Book/
3. https://www.mooc-list.com/course/uml-class-diagrams-software-engineering-edx
4. https://www.mooc-list.com/course/enterprise-software-lifecycle-management-edx

Table 1: Mapping Levels of COs to POs														
COs	**Program Objectives (POs)**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO1	3				3						2			3
CO2	3				3						2			3
CO3	3				3						2			3
CO4	3				3						2			3
CO5	3				3						2			3

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,5,11		L2
CO2	1,5,11		L2
CO3	1,5,11		L2
CO4	1,5,11		L3
CO5	1,5,11		L3

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UNIVERSAL HUMAN VALUES			
Course Code	**21HU315**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	**1:0:0**	**SEE Marks**	**50**
Total Hours	**13**	**Credits**	**01**

Course Learning Objectives:

This Course will enable students to

1. Enable students appreciate values, skills and behaviour with an appropriate understanding of 'Self' to attain sustained happiness and prosperity with right aspirations of life.
2. Develop a holistic perspective among the students towards physical needs and prosperity of life.
3. Develop a holistic approach and understand the importance of co-existence and living in harmony ensuring mutually fulfilling interaction with the society and nature.
4. Strengthening of self-reflection.
5. Development of commitment and courage to act.

UNIT – I

Need, Basic Guidelines, Content and Process for Value Education

Self-Exploration; 'Natural Acceptance' and Experiential Validation; Continuous Happiness and Prosperity; Right understanding, Relationship and Physical Facility; Understanding Happiness and Prosperity - living in harmony at various levels.

06 Hours

UNIT – II

Understanding Harmony in the Human Being, Family and Society

Understanding human being as a co-existence of the sentient 'I' and the material 'Body; the needs of Self ('I') and 'Body'; the Body as an instrument; Holistic perspective of Physical needs and Prosperity; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

05 Hours

UNIT – III

Whole existence as Coexistence: Implications of the above Holistic Understanding of Harmony and Professional Ethics

Understanding the harmony in the Nature and Existence; Existence as Co-existence, Holistic perception of harmony at all levels of existence; Natural acceptance of human values, Professional Ethics.

02 Hours

Course Outcomes:

At the end of the course the student will be able to:

1. Have a better self-exploration and understanding with a capacity to identify the priorities of life.
2. Generate Sustainable solution to problems with focus on human values and value-based living.
3. Have an understanding of the Holistic perspective of Physical needs
4. Understand and practice living in harmony, co-existence and natural acceptance
5. Exhibit Professional Ethics in the workplace

Mapping of POs & COs:

	PO											
CO	1	2	3	4	5	6	7	8	9	10	11	12
CO1	-	-	-	-	-	3	-	-	2	2	-	-
CO2	-	-	-	-	-	2	-	-	2	2	-	-
CO3	2	-	-	-	1	2	-	-	2	2	2	-
CO4	-	-	-	-	-	1	-	-	-	-	-	-
CO5	1	-	-	-	-	3	-	-	2	2	1	-

TEXTBOOKS:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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ADDITIONAL MATHEMATICS - II

Course Code	**21MATDIP302**	**Course Type**	**BSC**
Teaching Hours/Week (L:T:P: S)	**3:0:0**	**Credits**	**00**
Total Teaching Hours	**39+0+0**	**CIE (NO SEE) Marks**	**100**

Teaching Department: Mathematics

Mandatory Non – credit course (MNC): This course is prescribed to the lateral entry Diploma holders admitted to III semester of BE/B.Tech., programs, they shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student must fulfil the requirements during subsequent semester/s to appear for CIE.

Course Learning Objectives: This course will enable the students to master the basic tools of matrix theory, probability, differential equations, partial differential equations and become skilled for solving problems in science and engineering.

UNIT – I

Matrices — **15 Hours**

Elementary operations of a matrix, echelon form of a matrix, Rank of a matrix (both definitions). Consistency and solution of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of matrices.

Probabilitty

Finite sample space, event, mutually exclusive event, equally likely event, probability, addition theorem, conditional probability and independence conditions, multiplication theorem. Bayes' theorem.

UNIT – II

Differential Equations — **15 Hours**

Introduction, order and degree of differential equations, examples. Solution of first order and first-degree differential equations–variable separable method, Linear, Bernoulli’s and exact differential equations (without I. F).

Second And Higher Order Lde

Second order linear differential equation with constant coefficients, solution by inverse differential operator and method of variation of parameters.

UNIT – III

First And Higher Order Partial Differential Equations — **09 Hours**

First and higher order partial differential equations.Formation of partial differential equations byelimination of arbitrary constants/arbitrary functions. Solution of PDE's by direct integration method.

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 100% (No semester end exam). The student must obtain minimum of 40% marks individually both in CIE to pass. Based on this grading will be awarded.

Continuous Internal Evaluation:

1.	Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%).
2.	The class teacher must decide the topic for closed book test and Written Quiz. In the beginning only teacher must announce the methods of CIE for the subject.

TEXTBOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 43rd Edition, 2015.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition (Reprint), 2016.
3. P.L.Meyer, "Introduction of Probability and Statistical Applications", second edn. 1975, American Publishing.

REFERENCEBOOKS:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", Pearson, 2002.
2. T. Veerarajan, "Engineering Mathematics", McGraw-Hill, New Delhi, 2008.
3. B. V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw –Hill, New Delhi,2010.
4. N.P. Bali and M.Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
5. Shanthi Narayan, "Differential Calculus, 6th edition, Shyam Lal Charitable Trust, Delhi.

Course Outcomes Mapping with Program Outcomes

Program Outcomes→ / **↓ Course Outcomes**	1	2	3	4	5	6	7	8	9	10	11	12
CO1	2	3										
CO2	2	1										
CO3	2	3										
CO4	2	3										
CO5	2	3										

1: Low, 2: Medium, 3: High

Table 2: Mapping of COs to PIs, POs and BTL			
Course outcomes	**Program Outcomes**	**Performance Indicators**	**Bloom's Taxonomy Level**
CO1	1,2		L2
CO2	1,2		L2
CO3	1,2		L2
CO4	1,2		L2
CO5	1,2		L2