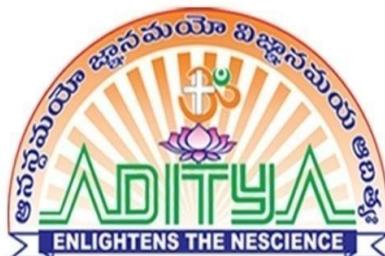


ACADEMIC REGULATIONS, PROGRAM STRUCTURE AND SYLLABUS

**COMPUTER SCIENCE AND
ENGINEERING**

for

**B.TECH. FOUR YEARS DEGREE PROGRAM
(Applicable to the batches admitted from 2020-21)**



ADITYA ENGINEERING COLLEGE

An Autonomous Institution

Approved by AICTE, Permanently Affiliated to JNTUK & Accredited by NAAC with 'A' Grade

Recognized by UGC under the sections 2(f) and 12(B) of UGC act 1956

Aditya Nagar, ADB Road, Surampalem - 533 437

ADITYA ENGINEERING COLLEGE

An Autonomous Institution

ACADEMIC REGULATIONS (AR20) FOR B.TECH. (REGULAR)

Applicable to the students of B.Tech.(Regular) admitted from the academic year 2020-21 onwards.

1. AWARD OF B. TECH. DEGREE

A student will be declared eligible for the award of B. Tech. Degree if the student fulfills the following academic regulations.

- 1.1 If the student pursued a Program of study in not less than four and not more than eight academic years. After eight academic years from the year of admission, the student shall forfeit his seat in B.Tech. and his admission stands cancelled.
- 1.2 The student shall register for 160 credits and secure all the 160 credits.
- 1.3 The students shall register for NCC/NSS activities and receive a “Satisfactory” grade.
- 1.4 The student shall register for all of the Mandatory courses and receive a “Satisfactory” grade.
- 1.5 A student shall be eligible for the award of B.Tech. Degree with Honors or Minor if the student earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or Minor and not for both simultaneously.

2. PROGRAMS OF STUDY

The following programs of study are offered at present as B.Tech. specializations.

S. No	Program	Program Code	Short Name
01	B.Tech - Civil Engineering	01	CE
02	B.Tech - Electrical and Electronics Engineering	02	EEE
03	B.Tech - Mechanical Engineering	03	ME
04	B.Tech - Electronics and Communication Engineering	04	ECE
05	B.Tech - Computer Science and Engineering	05	CSE
06	B.Tech - Information Technology	12	IT
07	B.Tech - Mining Engineering	26	Min.E
08	B.Tech - Petroleum Technology	27	PT
09	B.Tech - Agricultural Engineering	35	Ag.E
10	B.Tech - Computer Science & Engineering (Data Science)	44	CSE(DS)
11	B.Tech - Artificial Intelligence and Machine Learning	61	AIML

3. ADMISSION PROCESS

Admission to the B.Tech. program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/ University/ AICTE from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the Common Entrance Examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University/AICTE, subject to reservations prescribed.

4. PROGRAM PATTERN

- 4.1 The total duration of B.Tech. (Regular) program is for four academic years and each academic year of study is divided into two semesters.
- 4.2 The minimum number of instruction days in each semester is 90.
- 4.3 The medium of instruction for the entire B.Tech. undergraduate program in Engineering & Technology (including examinations and Project reports) will be in English only.
- 4.4 The student is introduced to “Choice Based Credit System (CBCS)” and Credit Based Semester System (CBSS) as indicated by UGC and AICTE. The credits allotted for a course depends on the following.

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

- 4.5 The student has to register for all courses in a semester. In each semester, a student shall mandatorily register for elective courses, which he/she wishes to pursue within a week from the starting of the class work with the advice of Head of the Department.
- 4.6 All the credit courses shall be considered for the calculation of SGPA and CGPA.

- 4.7 Every course shall be assessed using ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. The CIE marks shall be based on the Sessional Examinations.
- 4.8 In the course structure, in addition to the regular courses, there shall be 10 months internships, 05 Professional Elective courses, 04 Open Elective courses and 05 skill-oriented courses (two shall be skill-oriented courses from the same domain, one shall be employability skills course and the remaining two shall be skill-advanced courses either from the same domain or job-oriented skill courses which can be of interdisciplinary nature).
- 4.9 The 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester is included to acquire the skills required for a job and make engineering graduates connect with the needs of the industry and society at large.
- 4.10 The Open Electives are offered to students of all branches in general. A student shall choose an open elective, by consulting the Head of the Department (HOD) /advisor, from the list in such a manner that he/she has not studied the same course in any form during the program.
- 4.11 A faculty advisor/mentor/proctor is assigned to each student from the same department to provide guidance in career growth/course registration/ placements/opportunities for higher studies/GATE/other competitive exams etc.
- 4.12 A student who is eligible to appear for the Semester End Examination in a course but absent from it or has failed in it, may write the examination in that course when conducted next.
- 4.13 When a student is detained for lack of credits/shortage of attendance, the student shall be re-admitted into the same semester in which he has been detained, when offered next.

5. ATTENDANCE REQUIREMENTS

- 5.1 A student shall be eligible to write the Semester End Examinations if he acquires a minimum of 50% of attendance in each course and 75% of attendance in aggregate of all the courses.
- 5.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) on medical grounds in a semester may be granted by

the College Academic Committee and a student can be condoned for a maximum of three times only.

- 5.3 Shortage of Attendance below 65% in aggregate shall not be condoned.
- 5.4 Students whose shortage of attendance is not condoned in any semester are detained and not eligible to write their Semester End Examinations.
- 5.5 A medical certificate and a fee of Rs. 500/- shall be payable towards condonation for the shortage of attendance.
- 5.6 If any student fulfills the attendance requirement in the present semester, the student shall not be eligible for re-admission into the same semester.
- 5.7 If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill-oriented course offered by the Department, then his/her attendance in this course shall not be considered for the overall calculation of attendance.
- 5.8 If a student opted to study an elective course under MOOCs provided by an external agency, his/her attendance in this course shall not be considered in the overall calculation of attendance.
- 5.9 A student who has a shortage of attendance in a semester may seek re-admission into that semester when offered next, within 4 weeks from the date of the commencement of classwork.

6. PROMOTION RULES

- 6.1 A student will be promoted to the next semester if the student satisfies the attendance requirement of the present semester.
- 6.2 A student will be promoted from IV semester to V semester, if the student fulfills the attendance requirement in IV Semester and the academic requirement of 40% of the credits upto IV semester from all the examinations, whether or not the student takes the examinations.
- 6.3 A student shall be promoted from VI semester to VII semester if the student fulfills the attendance requirement in VI Semester and the academic requirements of 40% of the credits upto VI semester from all the examinations, whether or not the student takes the examinations.

7. GAP - Year

The concept of Student Entrepreneur in Residence shall be introduced and students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II semester to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing of the Gap Year.

8. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in each semester shall be evaluated course-wise with a maximum of 100 marks for Theory courses, Lab courses, Mandatory courses, Community Service Project and Summer Internship. The Full- semester Internship (Project) shall be evaluated for 200 marks.

8.2 For Theory courses, there shall be two Sessional Examinations during the semester for 30 marks each and Semester End Examination for 70 marks. The Sessional marks shall be awarded by giving a weightage of 80% for the best of the two Sessional Examinations and 20% for the other Sessional Examination. The Sessional Examination shall be conducted as Descriptive Examination for 15 marks, Objective Examination for 10 marks and Assignment for 5 marks. The I Sessional Examination is conducted for the first $2\frac{1}{2}$ units of syllabus and II Sessional Examination for the remaining $2\frac{1}{2}$ units of syllabus.

The descriptive examination is conducted for 90 minutes. Each descriptive examination question paper shall contain 3 questions of equal marks and all questions need to be answered. The Objective examination is conducted for 20 minutes and shall contain 20 Multiple Choice Questions with a weightage of $\frac{1}{2}$ mark each. For Assignment, the nature of the test (Design, Analysis, Simulation, Algorithms, Drawing, Quiz, Term paper, Tutorial, Surprise test, Seminar, Case study, Lab activity, Minor Project, Virtual Labs etc. as the case may be) will be intimated by the faculty concerned at the beginning of the semester.

The Semester End Examination is conducted for 70 marks for a duration of 180 minutes, which contains ten questions, two questions are from each unit and each question may have sub-questions. The student has to write one question from each unit. Each question carries 14 marks.

- 8.3 For Lab courses, there shall be Sessional Examination during the semester for 30 marks and Semester End Examination for 70 marks. The Sessional marks shall be awarded as, Continuous Evaluation -10 marks, Observation and Record -10 marks and laboratory examination -10 marks. The Semester End Examination shall be conducted by the faculty concerned and external examiner appointed by the Principal.
- 8.4 For Design, Drawing and estimation courses as a Theory course (such as Engineering Graphics, Machine Drawing, Design and Drawing of Reinforced Concrete Structures etc.), the distribution shall be 30 marks for Sessional evaluation (15 marks for continuous evaluation, and 15 marks for Sessional Examination) and 70 marks for Semester End examination. There shall be two Sessional Examinations in a Semester. The Sessional marks shall be awarded by giving a weightage of 80% for the best of two Sessional Examinations and 20% for the other Sessional Examination. The Semester End Examination pattern is based on the nature of the course.
- 8.5 For Integrated courses (Theory + Lab), there shall be a separate examination for Theory and Lab. The student has to pass the Theory examination and Lab examination simultaneously. Otherwise, the student has to appear for supplementary examination for both theory and lab. The final marks shall be calculated on weighted average method for converting marks into grade points. Sample calculation: Assume Integrated course is for 3 credits (Theory is for 2 credits and Lab is for 1 credit). If Total Marks obtained in Theory is 75 out of 100 (2 Credits) and Total Marks obtained in Lab is 90 out of 100 (1 Credit), the final marks for the integrated course are 80.

$$\text{Final Marks} = \frac{(75 * 2) + (90 * 1)}{3} = 80$$

- 8.6 A student is deemed to have passed a course (Theory or Lab) and earns the credits allotted to that course by securing not less than 35% of marks in the Semester End Examination, and a minimum 40% of marks of the total marks (sum of Sessional marks and Semester End Examination marks).
- 8.7 For Mandatory Courses, during a semester there shall be one examination for 100 marks in which a student should get a minimum of 40% of the marks to get the result as “Satisfactory”, otherwise the student performance is considered as “Not Satisfactory”. The examination is conducted online with multiple choice questions at the department level by covering the topics of all units. If a student fails to get

“Satisfactory” or is absent for examination, the student has to write the examination in that course when conducted next.

- 8.8 For Employability Skills (which includes Aptitude and Soft Skills) as a Mandatory Course, during a semester, there shall be an evaluation for 100 marks at the department level. There shall be a separate evaluation for Aptitude and Soft skills. The marks obtained for Employability Skills is the sum of marks obtained in Aptitude and Soft Skills together. The student should get a minimum of 40% of the marks for a “Satisfactory” result; otherwise, the student's performance is considered as “Not Satisfactory”. If a student fails to get “Satisfactory” or is absent for examination, the student has to write the examination in that course when conducted next.
- 8.9 For Employability Skills (which includes Aptitude and Soft Skills) as a credit course, the examination is conducted for 100 marks in which 30 marks are for Sessional Examination and 70 marks for Semester End Examination. There shall be two Sessional Examinations during the semester. There shall be a separate evaluation for Aptitude and Soft skills. For Aptitude, the Sessional Examination is conducted for 30 minutes with 30 questions (Multiple Choice Questions with a weightage of $\frac{1}{2}$ mark each) carrying 15 marks and for Soft Skills, the Sessional Examination is conducted as activity-based for 15 marks. The Sessional Marks for Employability Skills is the sum of marks obtained in Aptitude and Soft Skills together. The final Sessional marks shall be awarded by giving 80% weightage for the best of two Sessional Examinations and 20% weightage for other Sessional Examination.
The Semester End Examination for Aptitude is conducted for 140 minutes with 140 questions (Multiple Choice Questions with a weightage of $\frac{1}{4}$ mark each) carrying 35 marks and for Soft Skills, an activity-based examination is conducted for 35 marks by the faculty concerned and external examiner appointed by the Principal.
- 8.10 For Skill-oriented courses, a student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies approved by the HOD. If a student chooses to take a Certificate Course offered by external agency, the agency has to issue a certificate with “Satisfactory” condition. If the certificate issued by external agency is marked with “ Not Satisfactory” condition, the student shall

repeat the course either in the college or at external agency, when offered next. After successful completion, a student shall submit a record/report on the skills learned with the certificate issued by the agency included in it. The course will be evaluated at the end of the semester for 100 marks (record/report: 30 marks, examination & viva-voce: 70 marks) along with laboratory Semester End Examinations in the presence of internal examiner (course instructor or mentor) and External examiner appointed by Principal. There are no sessional marks. A student has to secure atleast 40% of marks to pass the course.

- 8.11 A student shall be permitted to pursue upto a maximum of two elective courses under MOOCs (Massive Open Online Courses) during the B.Tech. Program. Each of the courses must be a minimum of 12 weeks in duration. The student has to pursue and acquire a certificate for the MOOCs only from the organizations/agencies approved by the HOD. The student needs to earn a certificate by passing the examination. The student will be awarded the credits given in the curriculum only upon submission of the certificate. In case a student does not pass the courses registered through MOOCs, the same or alternative equivalent course may be registered again through MOOCs in the next semester with the recommendation of HOD.
- 8.12 The students shall mandatorily register for NCC/NSS activities and is required to participate in an activity specified by NCC/NSS officer during the second or third semesters. The grade shall be awarded as “Satisfactory” or “Not Satisfactory” in the III semester grade sheet on the basis of participation, attendance, performance and behavior. If a student obtains a “Not Satisfactory” grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
- 8.13 For Summer Internship, the students can undergo Industrial Training / Internship at Govt. Organizations, Construction agencies, Industries, Hydel and Thermal Power Plants, software MNCs etc. or do Research projects in National Laboratories/Academic Institutions like IITs, NITs etc. during summer breaks after completion of IV Semester and VI Semester End Examinations. However, the Summer Internship shall be evaluated in the V semester and VII semester, respectively. A group of students or even a single student can take up the Internship. Completion of internship is mandatory. After successful completion,

students shall submit a summer internship technical report to the department concerned. A certificate from the industry/organization shall be included in the report. The Summer Internship shall be evaluated for 100 marks at the end of the semester based on the report submitted and an oral presentation. The report carries 30 marks and oral presentation carries 70 marks. The student shall appear for the oral presentation before the Project Review Committee (PRC)* and an External Examiner appointed by Principal. There shall be no sessional marks for Summer Internship.

A Community Service Project (CSP) is to be carried out by each student for 180 hours during the summer breaks after II semester and the remaining part of CSP is to be done in the III semester weekends and holidays. The evaluation of CSP is done in III semester. The CSP is to be carried out in addition to the summer internships.

A group of students or even a single student can take up the Community Service Project. The students have to identify social problems existing in any geographical area/village and try to solve them technically or suggest to people the necessary solutions for solving these problems. After successful completion, students shall submit a detailed report to the department concerned. The detailed information regarding the Community Service Project is available in Appendix I.

The Community Service Project shall be evaluated for 100 marks at the end of semester based on the report submitted and an oral presentation. The report carries 75 marks and oral presentation carries 25 marks. The student shall appear for the oral presentation before the Project Review Committee (PRC)*. There shall be no sessional marks for Community Service Project (CSP).

A student has to secure atleast 40% of marks for successful completion in Summer Internship or Community Service Project. In case, a student fails, he/she shall reappear for the examinations when conducted next.

*The PRC consists of HOD, Supervisor, and a senior faculty member of the department.

- 8.14 For Full-semester Internship (Project) in the final semester, the student should mandatorily register and undergo internship and in parallel, he/she should work on a project with well-defined objectives. At the end of the semester, the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. For Project, 200 marks are awarded, out of which 60 marks shall be for

Sessional Evaluation and 140 marks for the Semester End Examination. A group of students or even a single student can take up the Internship for full semester. The supervisor shall assess the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students/staff and the same shall be evaluated by the PRC for 30 marks from four reviews. The Sessional marks for Project are the sum of marks allotted by the Supervisor and the marks allotted by PRC. The Semester End Examination (Viva-Voce) shall be conducted by the committee that consists of an External Examiner appointed by Principal and PRC.

- 8.15** The distribution and weightage of marks are as follows.

S. No	Components	CIE	SEE	Total
1 _c	Theory Courses	30	70	100
2	Lab Courses	30	70	100
3 _r	Mandatory Courses	----	100	100
4 _i	Skill Oriented Courses	----	100	100
5 _p	Summer Internship/Community Service Project	----	100	100
6 _t	Full-semester Internship (Project)	60	140	200

Viewing / Re-evaluation of the Semester End Examination: A student can request for Script Viewing / Revaluation of his/her answer booklet of theory courses only, on payment of a prescribed fee as per norms.

- 8.17** Supplementary Examinations: A student who has failed a course can appear for supplementary examinations as and when conducted.
- 8.18** Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Sessional/Semester End Examinations as per the malpractice rules.

9. HONORS PROGRAM

Students of a Department/Discipline are eligible to opt for Honors Program offered by the same Department/Discipline. A student shall be permitted to register for the Honors program at the beginning of the IV semester provided that the student must have acquired a minimum of 8.0 CGPA up to the end of III semester without any backlogs. A CGPA of 8 has to be maintained in the subsequent semesters in order to keep the Honors registration active. For pursuing honors degree, the entry level eligibility only is considered in IV semester. Further during the study of Honors degree, a student should not fail in any course studying under Honors

degree. The GPA of Honors degree courses is not considered, only pass or fail is considered. The detailed information regarding the Honors program is available in Appendix - II.

10. MINOR PROGRAM

Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If a Mechanical Engineering student selects courses from Civil Engineering under this scheme, he will get a Major degree in Mechanical Engineering with a Minor degree in Civil Engineering. A student shall be permitted to register for the Minor program at the beginning of the IV semester provided that the student must have acquired a minimum of 7.75 CGPA up to the end of III semester without any backlogs.

A student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree. For example, a B.Tech. Mechanical Engineering student can opt for the industry-relevant tracks like Data Mining, IoT, Machine learning etc.

The minor tracks can be the fundamental courses in CE, EEE, ME, ECE, CSE etc., or industry relevant tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

For pursuing minor degree, the entry level eligibility only is considered in IV semester. Further during the study of minor degree, a student should not fail in any course studying under minor degree. The GPA of minor degree courses is not considered, only pass or fail is considered. The detailed information regarding the Minor program is available in Appendix - III.

11. AWARD OF GRADE POINT AVERAGE AND CLASS

11.1 GRADING

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding Letter Grade and Grade Point as given below, depending on the range in which the marks obtained by the student fall.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F. If a

student is absent for the examination, it is denoted as AB.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

For Credit Courses:

Range of Marks (%)	Letter Grade	Level	Grade Point
≥ 90	A+	Outstanding	10
$\geq 80 \text{ & } <90$	A	Excellent	9
$\geq 70 \text{ & } <80$	B	Very Good	8
$\geq 60 \text{ & } <70$	C	Good	7
$\geq 50 \text{ & } <60$	D	Fair	6
$\geq 40 \text{ & } <50$	E	Satisfactory	5
<40	F	Fail	0
-	AB	Absent	0

For Mandatory Courses/Non-Credit Courses:

Range of Marks	Letter Grade	Result
≥ 40	S	Satisfactory
< 40	N	Not Satisfactory

11.2 **CALCULATION OF GRADE POINT AVERAGE**

i. Calculation of Semester Grade Point Average (SGPA)

The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student.

$$SGPA(S_i) = \frac{\sum(C_i \times G_i)}{\sum(C_i)}$$

where C_i is the number of credits of the i^{th} course and

G_i is the grade point scored by the student in the i^{th} course

ii. Calculation of Cumulative Grade Point Average (CGPA)

The CGPA is also calculated in the same manner taking into consideration all the courses undergone by a student over all the semesters of the program.

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum(C_i)}$$

where S_i is the SGPA of the i^{th} semester and

C_i is the total number of credits in that semester

- iii. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. While computing the SGPA/CGPA, the courses in which the student is awarded zero grade points will also be included.
- v. Grade Point Average can be converted into an equivalent percentage using

$$\text{Percentage of Marks} = (\text{CGPA} - 0.75) \times 10$$

vi. Illustration of Computation of SGPA and CGPA

Illustration for SGPA: Let us assume there are 6 courses in a semester and the grades obtained by a student are as follows:

Course	Credit	Grade Obtained	Grade point	$S_i = \text{Credit Point} (\text{Credit} \times \text{Grade})$
Course 1	3	B	8	$3 \times 8 = 24$
Course 2	4	C	7	$4 \times 7 = 28$
Course 3	3	D	6	$3 \times 6 = 18$
Course 4	3	A+	10	$3 \times 10 = 30$
Course 5	3	E	5	$3 \times 5 = 15$
Course 6	4	D	6	$4 \times 6 = 24$
	20			139

$$\text{SGPA} = 139/20 = 6.95$$

Illustration for CGPA: Let us assume the Credits and SGPA secured by the student in all the 8 semesters are as follows:

Semester 1	Semester 2	Semester 3	Semester 4
Credits: 20 SGPA: 6.95	Credits: 19 SGPA: 7.86	Credits: 21 SGPA: 5.68	Credits: 22 SGPA: 6.12
Semester 5	Semester 6	Semester 7	Semester 8
Credits: 20 SGPA: 6.34	Credits: 23 SGPA: 8.0	Credits: 21 SGPA: 6.45	Credits: 14 SGPA: 7.59

Thus,

$$\text{CGPA} = \frac{20 * 6.95 + 19 * 7.86 + 21 * 5.68 + 22 * 6.12 + 20 * 6.34 + 23 * 8 + 21 * 6.45 + 14 * 7.59}{160} = 6.84$$

11.3 AWARD OF CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA secured from 160 Credits
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)
First Class	≥ 6.75
Second Class	≥ 5.75 to < 6.75
Pass Class	≥ 4.75 to < 5.75

12. TRANSFER OF STUDENTS

- 12.1 The guidelines given by JNTUK / State Government will be followed for students to transfer from one college to another college.
- 12.2 In case of transferred students from other Universities/Colleges to AEC, the credits shall be transferred as per the academic regulations and course structure. Students have to obtain the credits of any equivalent courses as prescribed by the college if required.
- 12.3 There shall be no branch transfers after the completion of the admission process.

13. WITHHOLDING OF RESULTS

If the student has any dues in the college or is involved in indisciplinary /malpractice/ court cases, his result will be withheld.

14. TRANSITORY REGULATIONS

- 14.1 Discontinued or detained students are eligible for readmission as and when next offered.
- 14.2 The re-admitted students will be governed by the regulations under which the student has been admitted.

15. GENERAL

- 15.1 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- 15.2 The academic regulations should be read as a whole for the purpose of any interpretation.
- 15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
- 15.4 The college may change or amend the academic regulations or syllabi as and when the need arises and the changes or amendments made shall apply to all the students with effect from the dates notified by the College.

ACADEMIC REGULATIONS (AR20) FOR B.TECH.(LATERAL ENTRY)

Applicable to the students admitted into B.Tech. III semester from the Academic Year 2021-22 onwards

1. AWARD OF B. TECH. DEGREE

A student will be declared eligible for the award of B. Tech. Degree if the student fulfills the following academic regulations.

- 1.1 If the student pursued a Program of study in not less than three and not more than six academic years. After six academic years from the year of admission, the student shall forfeit his seat in B.Tech. and his admission stands cancelled.
- 1.2 The student shall register for 121 credits and secure all the 121 credits.
- 1.3 A student shall be eligible for the award of B.Tech. degree with Honors or Minor if the student earns 20 credits in addition to the 121 credits. A student shall be permitted to register either for Honors or Minor and not for both simultaneously.

2. PROMOTION RULES

- 2.1 A student will be promoted to the next semester if the student satisfies the attendance requirement of the present semester.
- 2.2 A student shall be promoted from VI semester to VII semester if the student fulfills the attendance requirement in VI semester and the academic requirements of 40% of the credits up to VI semester from all the examinations, whether or not the student takes the examinations.

3. AWARD OF CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA secured from 121 Credits
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)
First Class	≥ 6.75
Second Class	≥ 5.75 to < 6.75
Pass Class	≥ 4.75 to < 5.75

4. All the other regulations applicable to B. Tech (Regular) remain the same for B.Tech.(Lateral Entry) also.

ABBREVIATIONS

AICTE	All India Council for Technical Education
APSSDC	Andhra Pradesh State Skill Development Corporation
CBCS	Choice Based Credit System
CBSS	Credit Based Semester System
CGPA	Cumulative Grade Point Average
CIE	Continuous Internal Evaluation
GATE	Graduate Aptitude Test in Engineering
IIT	Indian Institute of Technology
JNTUK	Jawaharlal Nehru Technological University Kakinada
MNC	Multinational Corporation
MOOCs	Massive Open Online Courses
NCC	National Cadet Corps
NGO	Non-Governmental Organization
NIT	National Institute of Technology
NSS	National Service Scheme
PRC	Project Review Committee
RTI	Right to Information
SEE	Semester End Examination
SGPA	Semester Grade Point Average
UGC	University Grants Commission

APPENDIX - I
Guidelines for the Community Service Project

CONTENTS

1. Introduction
2. Objectives
3. Implementation of Community Service Project
4. Procedure
5. Expected outcomes
6. Time frame for the community service project
7. Assessment methodology for community service project
8. Model of the project report
9. Suggestive list of programmes under community service project
10. Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups.

COMMUNITY SERVICE PROJECT

Experiential learning through community engagement

1. INTRODUCTION

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

2. OBJECTIVES

- Community Service Project should be an integral part of the curriculum, as a part of the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;
- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop

societal consciousness, sensibility, responsibility and accountability

- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social

Problems, public administration system and the roles and responsibilities of different persons across different social systems.

3. IMPLEMENTATION OF COMMUNITY SERVICE PROJECT

- Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- The mentor should be a faculty member. Incentive could be given to the faculty mentors in terms of Academic Performance Indicators (API) scores. Or could even be made a compulsory in the service conditions laid down at the time of appointment.
- 4 Credits to be allocated for Community Service Project within the Choice Based Credit System (CBCS).
- The 180 hours of Community Service Project could be done in different areas.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc... Dept. of Zoology or other life sciences departments could concentrate on health awareness, blood groupings, awareness on blood donation or organ donation, etc. Dept. of Mathematics and Statistics could dwell upon empowering the youth

with analytical skills, Dept. of Commerce could create awareness on GST or Income Tax Returns or other taxes or consumerism.

- Sky will be the limit for organizing different programmes, provided the faculties are sufficiently motivated.
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship / apprentice / on the job training.

4. PROCEDURE

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
 - o First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. For ex., a student of Arts will focus on socio-economic conditions, social survey and about the Government's social security schemes. A student of Sciences could take up a survey on the health and hygiene conditions of that habitation, similarly, with other subject areas too. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.

o Secondly, the student/s could take up a project work related to their domain or subject area.

- The different areas, could be like –

o Agriculture

o Health

o Marketing and Cooperation

o Animal Husbandry

o Horticulture

o Fisheries

o Sericulture

o Revenue and Survey

o Natural Disaster Management

o Irrigation

o Law & Order

o Excise and Prohibition

o Mines and Geology

o Energy

A specific example,

- A student of B.Sc (BZC) will first conduct a survey of his/her habitation which could be related to a specific area or in a comprehensive way of socioeconomic conditions, covering all the areas listed above.

or

- Could conduct an awareness programme on Health and Hygiene or in Organic Farming or in Fisheries or in advocating prohibition of liquor or about renewable energy, or any other activity in an area as per his/her aptitude and the problems identified in the socioeconomic survey conducted.

- A project work shall be done on a particular topic related to his/her domain subject area.

4. EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

ROLE OF STUDENTS:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role and conduct the programmes involving Governmental agencies, Non-Governmental agencies or faculties of their college, etc.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.

- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

6. TIME FRAME FOR THE COMMUNITY SERVICE PROJECT

Duration: 8 weeks

Schedule:

Socio-Economic Survey of the Village/Habitation (Two weeks): A group of students under the guidance of faculty mentors conduct a Socioeconomic Survey of the Village/habitation. They will interact with people to acquire basic knowledge on the project chosen for study and conduct the survey using a structured questionnaire.

Community awareness campaign (one week): The students group takes up community awareness campaigns based on the above survey conducted by identifying the problems or vulnerable issues. They may also conduct house to house campaign on socially relevant theme. Ex: Government welfare programs, health care, consumer protection, food adulteration, digital transactions, information sources, etc.

Main Project (4 weeks): A group of students choose a topic related to their subject area and conduct a Project which includes, Data collection, interviews, internship in any select unit or department.

Report preparation (one week): The student should submit a project report duly signed by the mentor.

7. ASSESSMENT METHODOLOGY FOR COMMUNITY SERVICE PROJECT

Learning outcomes:

- To facilitate an understanding of the issues that confronts the vulnerable / marginalized sections of the society.
- To initiate team processes with the student groups for societal change.
- To provide students an opportunity to familiarize themselves with urban / rural community they live in.
- To enable students to engage in the development of the community.
- To plan activities based on the focused groups.

- To know the ways of transforming the society through systematic programme implementation.

The following is the evaluation methodology for awarding marks/grades.

There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 to 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in-charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

Project Log	20%
Project Implementation	30%
Project report	25%,
Presentation	25%

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

While grading the student's performance, using the student's project log, the following should be taken into account –

- a. The individual student's effort and commitment.
- b. The originality and quality of the work produced by the individual student.
- c. The student's integration and co-operation with the work assigned.
- d. The completeness of the logbook.

The assessment for the ***Community Service Project implementation*** shall include the following components and based on the entries of Project Log and Project Report:

- a. Orientation to the community development
- b. Conducting a baseline assessment of development needs
- c. Number and Quality of Awareness Programmes organised on beneficiary programmes and improvement in quality of life, environment and social consciousness, motivation and leadership, personality development, etc.
- d. Number and Quality of Intervention Programmes (Prevention or promotion programs that aim to promote behavioural change in defined community contexts to address social problems)

organised.

- e. Follow-up Programmes suggested (Referral Services, Bringing Community Participation)
- f. Developing short and mid-term action plans in consultation with local leadership and local government officers.

The **Project Report** shall be prepared as per the guidelines given in the Model Project Report.

The **Project Presentation** is to be made by the student after he/she reports back to the College.

The components for assessment are –

- a. assessing the involvement in the project
- b. presentation skills
- c. final outcome of the project as evinced by the student.

Example:

Name of the Student:	X.YY ZZZ	
Class & Year of Study	II B.A. 2021 - 2022	
Registered Number	000000	
Assessment Component	Max Marks	Marks Secured
1. Project Log	20	15
2. Project Implementation	30	20
3. Project Report	25	20
4. Presentation	25	20
TOTAL OUT OF 100	100	75

Letter grade	Grade Point	Credits	Credit Point
O (outstanding)	10	2	20
A+ (Excellent)	9	2	18
A (Very Good)	8	2	16
B+ (Good)	7	2	14
B (Above average)	6	2	12
C (Average)	5	2	10
D (Pass)	4	2	8
F (Fail)	0	2	0
Ab (Absent)	0	2	0

In the above example, 75 marks are converted to letter grade / grade point.

Letter grade	Grade Point	Credits	Credit Point
B+ (Good)	7	2	14

8. MODEL OF THE PROJECT REPORT

PART – A

1. Introduction:
 - A. About the Village / Habitation.
2. Socio-Economic Survey of the Village/Habitation.
 - A. Data collection using prescribed formats.
3. Problems identified and Analyses of the problems.
4. Short-term and long term action plan for possible solutions for the problems identified and that could be recommended to the concerned authorities for implementation.
5. Community awareness programmes conducted w.r.t the problems and their outcomes.

PART – B

1. A mini-project work in the related subject w.r.t the habitation/village. (For ex., a student of Botany may do a project on Organic Farming or Horticulture or usage of biofertilisers or biopesticides or effect of the inorganic pesticides, etc. A student of Zoology may do a project on Aquaculture practices or animal husbandry or poultry or health and hygiene or Blood group analysis or survey on the Hypertension or survey on the prevalence of diabetes, etc.

PART - C

1. Recommendations and conclusions.
2. References

9. SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following is the recommended list of projects for BA, B.Com, and B.Sc programmes. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Arts Students

1. Village demography
2. Healthcare programmes and their implementation
3. School education
4. Youth engagement
5. Women empowerment
6. Women education
7. Domestic violence
8. Culture, traditions, values and ethics
9. Employment of different sections
10. Status of socially deprived sections
11. Implementation of state development programmes
12. Implementation and impact of welfare schemes
13. Public distribution system
14. Social inclusiveness
15. Village governance
16. Health care system and its effectiveness
17. Information sources and their effectiveness
18. Entertainment media and habits
19. Social problems
20. Family and marriage systems across different social groups
21. Religion profile and their role in social development
22. Communal harmony
23. Innovative methods and practices

24. Village industry
25. Safety and security
26. Migration for employment
27. Infrastructure development
28. Facilities for quality life across different social groups
29. Leadership in family, community and social groups
30. Implementation of central schemes
31. Village development plans
32. Child labour
33. Sex education
34. Atrocities against women
35. Awareness of central government schemes and the level of participation
36. Community engagement programmes and their impact
37. Career orientation of youth
38. Skill development programmes and their impact
39. Alcohol and smoking habits and their impact on families and society
40. Crime rate, law and order and safety needs
41. Quality of Elementary education and accessibility
42. Factors considered for electing public representatives
43. Environment protection
44. Inter religious harmony
45. Treatment of aged persons
46. Sanitation systems
47. Tribal studies
48. Telugu literature and mondalics
49. Awareness of epics among youth and children
50. Anthropological survey
51. Music and dance
52. Performing arts
53. Social evils

For Commerce Students

1. Entrepreneurship
2. Agricultural products and marketing
3. Poultry business
4. Dairy business
5. Aquaculture
6. Wage system and Labour Welfare
7. Village industry products and marketing
8. Income and wealth distribution among different sections of the society
9. Entertainment services
10. Communication services
11. Banking services and habits
12. Insurance services and habits
13. Public distribution system
14. Vegetable marketing
15. Savings and Investments
16. Online purchases
17. Digital transactions
18. Use of electrical home appliances
19. Use of electronic home appliances
20. Personal transport
21. Consumer movement
22. Unfair trade practices
23. Food habits
24. Income distribution
25. Wealth distribution
26. Expenditure pattern on different product categories
27. Buying motives
28. Consumer behavior
29. Impact of celebrity advertising
30. Impact of TV on product choices
31. Usage of cell phones
32. Self-employed professionals
33. Construction
34. Leisure time management

35. Tourism
36. Leadership
37. Human resource development
38. Local administration
39. Office management in local governing bodies
40. Exports
41. Handicrafts
42. Handlooms
43. Public transport
44. Private transport
45. Cooperative societies
46. Shifts in occupations
47. Debt burden of different sections of the society
48. Time management
49. Dispute resolution systems
50. Commercial crops

For Science Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution

18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floriculture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood picture

**10. COMPLIMENTING THE COMMUNITY SERVICE PROJECT THE STUDENTS
MAY BE INVOLVED TO TAKE UP SOME AWARENESS CAMPAIGNS ON SOCIAL
ISSUES/SPECIAL GROUPS.**

The suggested programmes are –

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights

3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
 - i. Agriculture
 - ii. Health
 - iii. Marketing and Cooperation
 - iv. Animal Husbandry

- v. Horticulture
- vi. Fisheries
- vii. Sericulture
- viii. Revenue and Survey
- ix. Natural Disaster Management
- x. Irrigation
- xi. Law & Order
- xii. Excise and Prohibition
- xiii. Mines and Geology
- xiv. Energy

APPENDIX - II
Guidelines for B. Tech Honors Degree - B. Tech (Hons)

**(Applicable from the Academic Year 2019-20 (AR19) and Academic Year 2020-21
(AR20))**

I. INTRODUCTION

The goal of introducing B. Tech (Hons) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research. All the students pursuing regular B. Tech with prerequisite CGPA are eligible to register Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B. Tech Honors degree. The additional courses shall be advanced subjects in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives.

II. OBJECTIVES

The objectives of initiating the B. Tech (Honors) degree certification are:

- a) To encourage the undergraduates towards higher studies and research
- b) To prepare the students to specialize in core Engineering streams.
- c) To attain the high-level competence in the specialized area of Undergraduate programme
- d) To learn the best educational and professional skills in the specialized area after the completion of his undergraduate courses.
- e) To provide the opportunity to learn the post graduate level courses in the specified undergraduate program.

III. APPLICABILITY AND ENROLMENT

- (a) To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
- (b) The department offering Honors shall have at least one M. Tech in concerned stream, for B. Tech (Honors) registration.
- (c) Total number of seats offered for Honors programme shall be a maximum of 35% of sanctioned intake of major degree programme.
- (d) The allotment of seat into Honors degree is based on the percentage of marks obtained in the major degree programme. Percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students.
- (e) In the event of any tie during the seat allotment for a Honors degree, the concerned major degree department offering Honors shall conduct a test/interview on the prerequisite subjects of Honors degree and final decision shall be taken.
- (f) For applicability of Honors degree, both regular B Tech and Honors degree courses shall be successfully completed.
- (g) A student shall report to the concerned Principal of the college, if he/she is not interested to pursue/continue the Honors degree programme.
- (h) Transfer of credits from a particular Honors to regular B. Tech or another

major degree and vice-versa shall not be permitted.

IV. ENTRY LEVEL

- (a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree program can register for Honors degree at their choice in any same department offering major degree from III semester onwards
- (b) Students registering for Honors degree shall select the subjects from same branches/department based on the recommendations of BOS committee. For example, a student pursuing major degree in Electrical & Electronics Engineering shall select subjects in Electrical & Electronics Engineering only and he/she will get major and Honors degree in Electrical & Electronics Engineering
- (c) Only those students, who have a CGPA of 8.0 or above, without any backlog, will be permitted to register for Honors degree
- (d) Separate grade sheet will be given for the courses registered under Honors.
- (e) Students shall not be permitted to register for Honors degree after completion of VI semester.
- (f) Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for Honors degree.
- (g) The students shall complete Honors degree without supplementary appearance within stipulated period as notified by college exam section for the completion of regular major B. Tech program.
- (h) Honors degree shall not be awarded at any circumstances without completing the regular major B. Tech program in which a student got admitted.
- (i) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses for Honors degree.
- (j) If a student failed in any registered course of the Honors, he/she shall not be eligible to continue the B. Tech Honors. However, the additional credits and grades thus far earned by the student shall be included in a separate grade sheet.
- (k) The subjects completed under Honors degree program shall not be considered as equivalent subjects in case the student fails to complete the major degree

program.

- (l) Students completed their degree shall not be permitted to register for Honors degree.

V. STRUCTURE OF HONORS IN B. TECH

- (a) The student shall earn at least 20 credits for award of Honors degree from same branch/department/discipline registered for major degree.
- (b) Students can complete Honors degree courses either in the college or online from platforms like NPTEL/SWAYAM etc.
- (c) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses list in the departments, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.
- (d) The overall attendance in each semester of regular B. Tech courses and Honors degree courses shall be computed separately.
- (e) A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.
- (f) Student having less than 65% attendance in Honors courses shall not be permitted for semester end examinations.
- (g) A student detained due to lack of attendance in regular B. Tech program shall not be permitted to continue Honors program.
- (h) The teaching, examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses
- (i) Students may choose theory or practical courses to fulfil the minimum credit requirement.

- (j) Students shall be allowed to take maximum two subjects per semester pertaining to their Honors degree.
- (k) The students registered for Minor shall not be permitted to register for B. Tech (Honors).

VI. CREDITS REQUIREMENT

- (a) A student will be eligible to get B. Tech (Honors), if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM.
- (b) The colleges offering Honors degree courses shall be ready to teach the courses in offline at the college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies.
- (c) The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 8/12 weeks.
- (d) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.
- (e) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment.
- (f) The teaching and evaluation procedure of Honors courses offering in offline mode shall be similar to that of regular B. Tech courses
- (g) After successful completion of all Honors degree courses, the students will be awarded B. Tech (Honors).
- (h) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the Honors degree.

VII. PROCEDURE TO APPLYING FOR HONORS DEGREE

- (a) The department offering the Honors will announce courses required before the start of the session.
- (b) The interested students shall apply for the Honors course to the HOD of the concerned department

- (c) The concerned department will announce the list of the selected students for the Honors.
- (d) The whole process should be completed within one week before the start of every session.
- (e) Selected students shall be permitted to register the courses for Honors degree.

VIII. JOINING IN HONORS COURSES IN B. TECH

- (a) Each department offering the Honors degree shall submit the final list of selected students to the Principal.
- (b) The selected students shall submit a joining letter to the Principal through the concerned HOD.
- (c) The department offering Honors shall maintain the record of student pursuing the Honors degree.
- (d) With the approval of Principal and suggestion of advisor/mentor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the Honor degree.
- (e) Each department shall communicate the Honors courses registered by the students to the timetable drafting committee and accordingly the timetable will be drafted. Timetable drafting committee shall see that there is no clash in timetables.
- (f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor/mentor, subject teacher, HODs of Honors department and parent department and Principal within two weeks after registration of the course.

IX. PROCEDURE FOR MONITORING THE PROGRESS OF THE SCHEME

The students enrolled in the Honor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

X. ALLOCATION OF SEATS FOR HONORS DEGREE

- (a) The college will notify the number of the seats for Honors degree in each department well in advance before the start of the semester.
- (b) Total number of seats offered for Honors degree shall be a maximum of 35% of sanctioned intake of major degree program.
- (c) Each department of concerned institute will notify the seats for the Honors well before the start of each session as per the following Table

S. No	Name of the course	Sanction seats of major degree program	Seats offered for Honors	Courses offered	Credits for each course

XI. COURSE FEES FOR REGISTRATION OF SUBJECTS IN MAJOR DEGREE

There is no fee for registration of subjects for major degree program offered in offline at the respective colleges.

XII. EXAMINATIONS

- (a) The examination for the Honors degree courses offered in offline shall be conducted along with regular B. Tech program.
- (b) The examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses.
- (c) A separate transcript shall be issued for the Honors subjects passed in each semester.
- (d) There is no supplementary examination for the failed subjects in a Honors degree program.

XIII. EXAMINATION FEES

Examination Fees will be as per the norms of college.

APPENDIX – III**Guidelines for B. Tech Minor Degree in Engineering**

(Applicable from the Academic Year 2019-20 (AR19) and Academic Year 2020-21 (AR20))

I. INTRODUCTION

Looking to global scenario, engineering students should have knowledge of subjects from other branches and some advanced subjects of their respective branch in which they are pursuing the degree. To complement the same, the College has decided to take an initiative from 2020-21 in academics by introducing minor to the undergraduate students enrolled in the B. Tech. This gives a provision to the students to pursue minor other than the discipline in which student got admitted. An aspiring student can choose the courses and laboratories in any other discipline and can get a minor in the chosen specialization in addition to regular major B. Tech degree. This way undergraduates are not restricted to learn about courses only in the discipline they get admitted to but can choose courses of their interest to later on take up a career path of their liking. The students taking up a minor course will get additional credits. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the minor. The department concerned will determine the required courses for award of minor. The subjects in minor program would be a combination of mostly core and some electives.

II. OBJECTIVES

The objectives of initiating the minor certification are:

- (a) To diversify the knowledge of the undergraduates.
- (b) To make the undergraduates more employable.
- (c) To have more educational and professional skills after the completion of hisundergraduate courses.
- (d) To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

III. APPLICABILITY AND ENROLMENT

- (a) To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology
- (b) There shall be no limit on the number of programs offered under Minor. The minor programs in emerging technologies based on expertise in the respective departments may be offered and minor can also be offered in collaboration with the relevant industries/agencies.
- (c) Total number of seats offered for a minor program shall be a maximum of 35% of sanctioned intake of major degree program.
- (d) If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with Board of Studies.
- (e) The allotment of seat into minor is based on the percentage of marks obtained in the major degree program. Percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students.
- (f) In the event of any tie during the seat allotment for a minor, the concerned major degree department offering minor shall conduct a test/interview on the prerequisite subjects of minor and final decision shall be taken.
- (g) For applicability of minor, both regular B Tech and minor courses shall be successfully completed.
- (h) A student shall report the concerned Principal of the college if he/she is not interested to pursue/continue the minor program.
- (i) Transfer of credits from a particular minor to regular B. Tech or another major degree and vice-versa shall not be permitted.

IV. ENTRY LEVEL

- (a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree program can register for minor at their choice in any other department offering minor from IV semester onwards.
- (b) Students registering for minor shall select the subjects from other branches.

For example, a student pursuing major degree in Electrical & Electronics Engineering shall select the subjects specified for minor in Civil Engineering and he/she will get major degree of Electrical & Electronics Engineering with minor of Civil Engineering.

- (c) Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. However, students pursuing major degree in a particular Engineering are not allowed to register for minor in the same engineering branch.
- (d) Only those students, who have a CGPA of 7.75 or above, without any backlog, will be permitted to register for a minor.
- (e) Separate grade sheet will be given for the courses registered under minor.
- (f) Students shall not be permitted to register for minor after completion of VI semester.
- (g) Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for minor.
- (h) Minor shall not be awarded at any circumstances without completing the regular major B. Tech program in which a student got admitted.
- (i) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of minor.
- (j) If a student failed in any registered course of the minor, he/she shall not be eligible to continue the B.Tech minor. However, the additional credits and grades thus far earned bythe student shall be included in separate grade sheet.
- (k) The subjects completed under minor program shall not be considered as equivalent the subjects in case the student fails to complete the major degree program.
- (l) Students who completed their degree shall not be permitted to register for minor.

V. STRUCTURE OF MINOR IN B. TECH

- (a) The student shall earn at least 20 credits for award of minor from other branch/department/discipline registered for major degree.
- (b) Students can complete minor courses either in the college or in online from

platforms like NPTEL/SWAYAM etc.

- (c) The overall attendance in each semester of regular B. Tech courses and minor courses shall be computed separately.
- (d) A student shall maintain an overall attendance of 75% in all registered courses of minor to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.
- (e) Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.
- (f) A student detained due to lack of attendance in regular B. Tech program shall not be permitted to continue minor program.
- (g) The teaching, examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses
- (h) The students may choose theory or practical courses to fulfil the minimum credit requirement.
- (i) The students may be allowed to take maximum two subjects per semester pertaining to their minor.
- (j) The students are permitted to opt for only a single minor course in his/her entire tenure of B. Tech (Engineering)
- (k) The students registered for B. Tech (Hons) shall not be permitted to register for minor.
- (l) The student is not permitted to take the electives courses from the parent department fulfil the minimum credit requirement.

VI. CREDITS REQUIREMENT

- (a) A Student will be eligible to get minor along with major degree engineering if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM.
- (b) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor, with four courses, each carrying 4

credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

- (c) The colleges offering minor courses shall be ready teach the courses in offline at their college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies.
- (d) The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 8/12 weeks.
- (e) The teaching and evaluation procedure of minor courses offering in offline mode shall be similar to that of regular B. Tech courses
- (f) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment.
- (g) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.
- (h) After successful completion of all minor courses, the student will be awarded with minor degree.
- (i) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the minor.

VII. PROCEDURE TO APPLYING FOR THE MINOR

- (a) The department offering the minor will announce specialization and courses before the start of the session.
- (b) The interested students shall apply through the HOD of his/her parent department.
- (c) The concerned department will announce the list of the selected students for the minor.
- (d) The whole process should be completed within one week before the start of every session.
- (e) Selected students shall be permitted to register the courses for minor.

VIII. REGISTERING FOR MINOR COURSES

- (a) Each department offering the minor will submit the final list of selected students to the Principal.
- (b) The selected students shall submit a joining letter to the Principal through the concerned HOD offering the minor. The student shall inform same to the HOD of his/her parent department.
- (c) Both parent department and department offering minor shall maintain the record of student pursuing the minor
- (d) With the approval of Principal and suggestion of advisor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the minor.
- (e) Each department shall communicate the minor courses registered by the students to the time table drafting committee and accordingly time table will be drafted. Timetable drafting committee shall see that there is no clash in time tables.
- (f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor, subject teacher, HODs of minor department and parent department and Principal within two weeks after registration of the course.

IX. PROCEDURE FOR MONITORING THE PROGRESS OF THE SCHEME

The students enrolled in the minor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

X. ALLOCATION OF SEATS FOR MINOR

- (a) The college will notify the number of the seats for minor in the concerned department well in advance before the start of the semester.
- (b) Total number of seats offered for a minor program shall be a maximum of

35% of sanctioned intake of major degree program.

- (c) The list of the elective for minor will be offered from the list of running majors in the concerned subjects. Each department of concerned institute will notify the seats for the minor well before the start of each session as per the following Table.

S. No	Name of the course	Sanction seatsof major degree program	Seats offered for minor	Courses offered	Credits for each course

XI. COURSE FEES FOR REGISTRATION OF SUBJECTS IN MINOR DEGREE

There is no fee for registration of subjects for minor degree program offered in offline at the respective colleges.

XII. EXAMINATIONS

- (a) The examination for the minor courses offered in offline shall be conducted along with regular B. Tech program.
- (b) The examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses.
- (c) A separate transcript shall be issued for the minor subjects passed in each semester.
- (d) There is no supplementary examination for the failed subjects in a minor program.

XIII. EXAMINATION FEES

Examination Fees will be as per the norms of college.

ADITYA

ENGINEERING COLLEGE

An AUTONOMOUS Institution

Approved by AICTE & Affiliated to JNTUH & Accredited by NAAC with 'A' Grade
Recognized by AEC under sections 3(f) and 25(b) of UGC Act, 1956

99496 76682

Email: office@aec.edu.in

Website: www.aec.edu.in

Date: 18/01/2023

CREDIT TRANSFER FOR THE SKILL - ORIENTED COURSES

As per the orders of Affiliating University JNTUK dated 17-01-23 regarding credit transfer for the Skill-oriented Courses, all the students studying the Skill oriented courses/ Job oriented Courses under AR20 B.Tech Regulations are hereby informed that the certifications completed through NASSCOM/NPTEL/L&T/any other Industry shall be considered as skill-oriented courses of the curriculum and are facilitated with credit transfer. However, the students should avoid the courses already pursued or offered through the curriculum as it may otherwise lead to duplication and repetition of the same course.



PRINCIPAL
PRINCIPAL

ADITYA ENGINEERING COLLEGE
SURAMPalem - 533 437



Aditya Nagar, ADB Road, Surampalem-533 437, Near Kakinada, E.G.D.E., A.P., INDIA

VISION & MISSION OF THE INSTITUTE

VISION

To emerge as a premier institute for quality technical education and innovation.

MISSION

M1: Provide learner centric technical education towards academic excellence

M2: Train on technology through collaborations

M3: Promote innovative research & development

M4: Involve industry institute interaction for societal needs

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VISION & MISSION OF THE DEPARTMENT

VISION

To emerge as a competent Centre of excellence in the field of Computer Science and Engineering for industry and societal needs..

MISSION

M1: Impart quality and value based education

M2: Inculcate the inter personal skills and professional ethics

M3: Enable research through state-of-the-art infrastructure

M4: Collaborate with industries, government and professional societies

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the Program will

PEO 1	Adopt new technologies and provide innovative solutions.
PEO 2	Be employable, become an entrepreneur or researcher for a successful career.
PEO 3	Demonstrate interpersonal, multi-disciplinary skills and professional ethics to serve society.

PROGRAM OUTCOMES (POs)

After successful completion of the program, the graduates will be able to

PO1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems, reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	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.
PO6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO10	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.
PO11	Project Management and Finance: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments.
PO12	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.
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PROGRAM SPECIFIC OUTCOMES (PSOs)

After successful completion of the program, the graduates will be able to

PSO1	Develop efficient solutions to real world problems using the domains of Algorithms, Networks, database management and latest programming tools and techniques.
PSO2	Provide data centric business solutions through emerging areas like IoT, AI , data analytics and Block Chain technologies.

Mission of the department – PEOs mapping

PEO's Statements		M1	M2	M3	M4
PEO 1:	Adopt new technologies and provide innovative solutions.	2	2	3	3
PEO 2:	Be employable, become an entrepreneur or researcher for a successful career.	2	3	2	2
PEO 3:	Demonstrate interpersonal, multi-disciplinary skills and professional ethics to serve society.	2	3	2	2

Note:

Mapping / Correlation levels
1: Slight (Low)
2: Moderate (Medium)
3: Substantial (High)

PROGRAM STRUCTURE								
I SEMESTER								
Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201HS1T01	Communicative English	HSMC	Theory	3	0	0	3	3
201BS1T01	Differential Equations and Linear algebra	BSC	Theory	3	0	0	3	3
201BS1T04	Engineering Chemistry	BSC	Theory	3	0	0	3	3
201ES1T02	Programming for Problem Solving using C	ESC	Theory	3	0	0	3	3
201ES1I02	Computer Engineering Workshop	ESC	Integrated	2	0	2	4	3
201HS1L01	Communicative English Lab	HSMC	Lab	0	0	3	3	1.5
201BS1L03	Engineering Chemistry Lab	BSC	Lab	0	0	3	3	1.5
201ES1L02	Programming for Problem Solving using C Lab	ESC	Lab	0	0	3	3	1.5
201MC1T01	Environmental Science	MC	Theory	2	0	0	2	0
TOTAL				16	0	11	27	19.5
II SEMESTER								
Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201BS2T07	Numerical Methods and Complex Variables	BSC	Theory	3	0	0	3	3
201BS2T09	Applied Physics	BSC	Theory	3	0	0	3	3
201ES2T11	Computer Organization	ESC	Theory	3	0	0	3	3
201ES2T04	Python Programming	ESC	Theory	3	0	0	3	3
201ES2T07	Data Structures through C	ESC	Theory	3	0	0	3	3
201BS2L04	Applied Physics Lab	BSC	Lab	0	0	3	3	1.5
201ES2L06	Data Structures through C Lab	ESC	Lab	0	0	3	3	1.5
201ES2L14	Python Programming Lab	ESC	Lab	0	0	3	3	1.5
201MC2L01	Professional Communication Skills Lab	MC	Lab	0	0	3	3	0
201MC2T02	Constitution of India	MC	Theory	2	0	0	2	0
TOTAL				17	0	12	29	19.5

III SEMESTER								
Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201CS3T01	Advanced Data Structures	PCC	Theory	3	0	0	3	3
201CS3T02	Object Oriented Programming through C++	PCC	Theory	3	0	0	3	3
201CS3T03	Operating Systems	PCC	Theory	3	0	0	3	3
201CS3T04	Software Engineering	PCC	Theory	3	0	0	3	3
201BS3T13	Discrete Mathematics	BSC	Theory	3	0	0	3	3
201CS3L01	Object Oriented Programming through C++ Lab	PCC	Lab	0	0	3	3	1.5
201CS3L02	Operating Systems Lab	PCC	Lab	0	0	3	3	1.5
201CS3L03	Unix and Shell Programming Lab	PCC	Lab	0	0	3	3	1.5
201CS3P01	<u>Skill Oriented Course-I</u> Applications of python-numpy (OR) Web Application Development using Full Stack Frontend Development–Module—I	SC	Lab	0	0	4	4	2
201CS3P02								
201CS3P03	Community Service Project	PROJ	PROJ	0	0	8	8	4
201MC3T03	Biology for Engineers	MC	Theory	2	0	0	2	0
TOTAL				17	0	21	38	25.5

IV SEMESTER

Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201BS4T16	Probability and statistics	BSC	Theory	3	0	0	3	3
201CS4T05	Formal Languages and Automata Theory	PCC	Theory	3	0	0	3	3
201CS4T06	Database Management Systems	PCC	Theory	3	0	0	3	3
201CS4T07	Java programming	PCC	Theory	3	0	0	3	3
201HS4T03	Managerial Economics and Financial Analysis	HSMC	Theory	3	0	0	3	3
201CS4L04	Database Management Systems Lab	PCC	Lab	0	0	3	3	1.5
201CS4L05	Java Programming Lab	PCC	Lab	0	0	3	3	1.5
201CS4L06	R Programming Lab	PCC	Lab	0	0	3	3	1.5
201CS4S02	<u>Skill Oriented Course-II</u> Applications of python-pandas(OR) Web Application Development using Full Stack Frontend Development-Module-II	SC	Lab	0	0	4	4	2
201CS4S01								
201MC4T04	Essence of Indian Traditional Knowledge	MC	Theory	2	0	0	2	0
TOTAL				17	0	13	30	21.5

V SEMESTER

Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201CS5T01	Computer Networks	PCC	Theory	3	0	0	3	3
201CS5T02	Design and Analysis of Algorithms	PCC	Theory	3	0	0	3	3
201CS5T03	Data Ware Housing and DataMining	PCC	Theory	3	0	0	3	3
-	Professional Elective -I	PEC	Theory	3	0	0	3	3
-	Open Elective - I (OR)	OEC/J OE	Theory	3	0	0	3	3
201CS5J01	Job Oriented Elective –I Mean Stack Technologies							
201CS5L01	Computer Networks Lab	PCC	Lab	0	0	3	3	1.5
201CS5L02	Data Mining Lab	PCC	Lab	0	0	3	3	1.5
201CS5P01	Summer Internship -I	PROJ	PROJ	0	0	3	3	1.5
201CS5S01	Skill Oriented Course – III Robotic Process Automation. (OR) MEAN Stack Technologies-Module I- MongoDB, Express.js, Angular JS Node.js and AJAX.	SC	Lab	0	0	4	4	2
201CS5S02								
201MC5T01	Intellectual Property Rightsand Patents	MC	Theory	2	0	0	2	0
TOTAL				17	0	13	30	21.5

VI SEMESTER

Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201CS6T01	Machine Learning	PCC	Theory	3	0	0	3	3
201CS6T02	Compiler Design	PCC	Theory	3	0	0	3	3
201CS6T03	Cryptography and Network Security	PCC	Theory	3	0	0	3	3
-	Professional Elective-II	PEC	Theory	3	0	0	3	3
-	Open Elective – II (OR)	OEC/J OE	Theory	3	0	0	3	3
201CS6J01	Job Oriented Elective-II Optimization In Operation Research							
201CS6L01	Machine Learning using Python Lab	PCC	Lab	0	0	3	3	1.5
201CS6L02	Compiler Design and Object Oriented Analysis and Design Lab	PCC	Lab	0	0	3	3	1.5
201CS6L03	Cryptography and Network Security Lab	PCC	Lab	0	0	3	3	1.5
201CS6S01	Skill Oriented Course – IV Big Data:Spark. (OR)	SC	Lab	0	0	4	4	2
201CS6S02	MEAN Stack Technologies-Module II- MongoDB, Express.js, Angular JS Node.js and AJAX.							
201MC6T02	Employability Skills	MC	Theory	2	0	0	4	0
201MC6T01	Professional Ethics and Human Values	MC	Theory	2	0	0	2	0
TOTAL				19	0	13	32	21.5

VII SEMESTER

Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
-	Professional Elective-III	PEC	Theory	3	0	0	3	3
-	Professional Elective-IV	PEC	Theory	3	0	0	3	3
-	Professional Elective -V	PEC	Theory	3	0	0	3	3
-	Open Elective – III (OR)	OEC/J OE	Theory	3	0	0	3	3
201CS7J01	Job Oriented Elective-III API And Micro Services							
-	Open Elective – IV (OR)	OEC/J OE	Theory	3	0	0	3	3
201CS7J02	Job Oriented Elective-IV Secure Coding Techniques							
201HS7T01	Management Science	HSMC	Theory	3	0	0	3	3
201CS7S01	Skill Oriented Course- V PYTHON: Deep Learning /APSSDC offered Courses. (OR) Continuous Integration and Continuous Delivery using DevOps.	SC	Lab	0	0	4	4	2
201CS7S02								
201CS7P01	Summer Internship- II	PROJ	PROJ	0	0	6	6	3
201MC7T01	Research Methodology	MC	Theory	2	0	0	0	0
TOTAL				18	0	10	28	23

VIII SEMESTER

Course Code	Course Title	Course Component	Course Type	Total Number of contact hours				Credits (C)
				Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
201CS8P01	Project (Full Semester Internship)	PROJ	PROJ	0	0	16	16	8
201MC8T01	Universal Human Values – II Understanding Harmony	PCC	Theory	3	0	0	0	0
TOTAL				3	0	16	16	8

BSC: Basic Sciences Courses; HSMC: Humanities and Social Sciences including Management Courses; ESC: Engineering Sciences Courses; PCC: Professional Core Courses; SC: Skill Oriented Course; PEC: Professional Elective Courses; OEC: Open Elective Courses; JOE: Job Oriented Elective; MC: Mandatory Courses; PROJ: Project.

AR 20 PROGRAM STRUCTURE-DISTRIBUTION OF CREDITS										
SEM	HSMC	BSC	ESC	PCC	PEC	OEC	MC	SC	PROJ	Total Credits
I	4.5	7.5	7.5				0			19.50
II		6	13.5				0			19.50
III		3		16.5				2		21.50
IV	3		4.5	12			0	2		21.50
V				12	3	3	1.5	2		21.50
VI				13.5	3	3	0	2		21.50
VII	3				9	6	3	2		23.00
VIII									12	12.00
Credits	10.5	16.5	25.5	54	15	12	4.5	10	12	160
%	6.56%	10.31%	15.94%	33.75%	9.38%	7.50%	2.81%	6.25%	7.50%	100.00%

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits
Basic Sciences Courses (BSC)	10.43	24	19.5
Engineering Sciences Courses (ESC)	10.86	25	21
Humanities and Social Sciences including Management Courses (HSMC)	5.2	12	10.5
Professional Core Courses (PCC)	31.3	72	55.5
Professional Elective Courses (PEC)	6.5	15	15
Open Elective Courses (OEC)	5.2	12	12
Project(s) (PROJ)	14.34	33	16.5
Any other(SOC/Mandatory Courses (MC))	16.08	37	10
Total	100%	230	160

Professional Electives

Professional Elective – I (V Semester)			Professional Elective – II (VI Semester)		
S.No	Course Code	Name of the Course	S.No	Course Code	Name of the Course
1	201CS5E01	Artificial Intelligence	1	201CS6E01	Big Data Analytics
2	201CS5E02	Human Computer Interaction	2	201CS6E02	Mobile Computing
3	201CS5E03	Software Project Management	3	201CS6E03	Object Oriented Analysis and Design
4	201CS5E04	Advanced Unix Programming	4	201CS6E04	Network Programming
Professional Elective – III (VII Semester)			Professional Elective – IV (VII Semester)		
S.No	Course Code	Name of the Course	S.No	Course Code	Name of the Course
1	201CS7E01	Data Science	1	201CS7E05	Computer Vision
2	201CS7E02	Cloud Computing	2	201CS7E06	Social Networks & Semantic Web
3	201CS7E03	Distributed Systems	3	201CS7E07	Software Architecture and Design Pattern
4	201CS7E04	Cyber Security & Forensics	4		MOOCS-NPTEL/ SWAYAM
Professional Elective – V (VII Semester)					
S.No	Course Code	Name of the Course			
1	201CS7E08	Deep Learning Techniques			
2	201CS7E09	Block-Chain Technologies			
3	201CS7E10	Agile Methodologies (Using Devops)			
4		MOOCS-NPTEL/ SWAYAM			

Track	Professional Elective I	Professional Elective II	Professional Elective III	Professional Elective IV	Professional Elective V
Data Science and Machine Intelligence	Artificial Intelligence	Big Data Analytics	Data Science	Computer Vision	Deep Learning Techniques
Applications/ Generic	Human Computer Interaction	Mobile Computing	Cloud Computing	Social Networks & Semantic Web	Block-Chain Technologies
Software Systems Engineering	Software Project Management	Object Oriented Analysis and Design	Distributed Systems	Software Architecture and Design Pattern	Agile Methodologies (Using Devops)
Others	Advanced Unix Programming	Network Programming	Cyber Security & Forensics	MOOCs-NPTEL/SWAYAM	MOOCs-NPTEL/SWAYAM

Note: Open Elective Course (OEC) must be selected from the list of Open Elective Courses offered by Other Department(s) only.

OPEN ELECTIVE - I (V Semester)			
S. No	Course Code	Course Name	Offered By Department
1	201CE5O01	Basic Concrete Technology	CE
2	201CE5O02	Waste Water Management	CE
3	201CE5O03	Basic Surveying	CE
4	201EE5O01	DC Machines and Transformers	EEE
5	201EE5O02	Analog Electronic Circuits	EEE
6	201EE5O03	Basic Electrical Measurements	EEE
7	201ME5O01	Renewable Energy Sources	ME
8	201ME5O02	Fundamentals of Mechanical Engineering	ME
9	201ME5O03	Supply Chain Management	ME
10	201ME5O04	3D Printing	ME
11	201ME5O05	Entrepreneurship Development and Incubation	ME
12	201ME5O06	Automobile Engineering	ME
13	201EC5O01	Principles of Signals & Systems	ECE
14	201EC5O02	Introduction to Internet of Things	ECE
15	201EC5O03	Switching Theory and Logic Design	ECE
16	201CS5O01	Object Oriented Programming through Java	CSE
17	201CS5O02	Data Base Management Systems	CSE
18	201IT5O01	Computer Organization	IT
19	201IT5O02	Computer Graphics	IT
20	201PT5O01	Fundamentals of Petroleum Industry	PT
21	201PT5O02	Fundamentals of Chemical Industry	PT
22	201MI5O01	Overview of Mining	Min.E
23	201AG5O01	Basic Crop Production Practices	Ag.E
24	201AG5O02	Groundwater, Wells and Pumps	Ag.E

OPEN ELECTIVE - II (VI Semester)

S. No	Course Code	Course Name	Offered By Department
1	201CE6O01	Repair & Rehabilitation of Structures	CE
2	201CE6O02	Industrial Waste Water Management	CE
3	201CE6O03	Roadways, Railways & Airways	CE
4	201EE6O01	Induction and Synchronous Machines	EEE
5	201EE6O02	Non-Conventional Energy Resources	EEE
6	201EE6O03	Energy Audit, Conservation & Management	EEE
7	201ME6O01	Solar Energy Utilisation	ME
8	201ME6O02	Basic Thermodynamics and Heat Transfer	ME
9	201ME6O03	Introduction to Hydraulics & Pneumatics	ME
10	201ME6O04	3D Printing	ME
11	201ME6O05	Robotics	ME
12	201ME6O06	Management Science	ME
13	201ME6O07	Entrepreneurship Development and Incubation	ME
14	201ME6O08	Automotive Aerodynamics	ME
15	201EC6O01	Principles of Communications	ECE
16	201EC6O02	Biomedical Instrumentation	ECE
17	201EC6O03	ECAD Tools	ECE
18	201CS6O01	Python Programming	CSE
19	201CS6O02	Web Technologies	CSE
20	201IT6O01	Operating Systems	IT
21	201IT6O02	Robotic Process Automation	IT
22	201PT6O01	Unconventional Hydrocarbon Resources	PT
23	201PT6O02	Asset Management	PT
24	201MI6O01	Industrial Safety Practices	Min.E
25	201MI6O02	Electrical Equipment In Mines	Min.E
26	201AG6O01	Engineering Properties of Agricultural Produce	AgE
27	201AG6O02	Plastic Applications In Agriculture	AgE

OPEN ELECTIVE - III (VII Semester)			
S. No	Course Code	Course Name	Offered By Department
1	201CE7O01	Natural Disaster Management & Mitigation	CE
2	201CE7O02	Basics Of Soil Mechanics	CE
3	201CE7O03	Construction Materials And Equipments	CE
4	201EE7O01	Special Electrical Machines	EEE
5	201EE7O02	Electrical And Hybrid Vehicles	EEE
6	201EE7O03	Instrumentation	EEE
7	201ME7O01	Optimization Techniques	ME
8	201ME7O02	Energy Conservation	ME
9	201ME7O03	Introduction To Material Handling System	ME
10	201ME7O04	Robotics	ME
11	201EC7O01	Discrete Time Signal Processing	ECE
12	201EC7O02	Linear And Digital Ic Applications	ECE
13	201EC7O03	Principles Of Embedded Systems	ECE
14	201CS7O01	Ai Tools & Techniques	CSE
15	201CS7O02	Cyber Security	CSE
16	201IT7O01	Block Chain Technologies	IT
17	201PT7O01	Risk Management In Petroleum Industry	PT
18	201PT7O02	Carbon Sequestration	PT
19	201MI7O01	Communication System In Mines	Min.E
20	201AG7O01	Water Harvesting And Soil Conservation Structures	Ag.E

OPEN ELECTIVE - IV (VII Semester)			
S. No	Course Code	Course Name	Offered By Department
1	201CE7O04	Composite Materials	CE
2	201CE7O05	Basics of RS & GIS	CE
3	201CE7O06	Safety Engineering	CE
4	201EE7O04	Industrial Electrical Systems	EEE
5	201EE7O05	Electrical Materials	EEE
6	201EE7O06	Electrical Safety	EEE
7	201ME7O05	Entrepreneurship Development and Incubation	ME
8	201ME7O06	Automotive Safety	ME
9	201ME7O07	Fabrication Processes	ME
10	201ME7O08	Smart Materials	ME
11	201EC7O04	Fundamentals of Image Processing	ECE
12	201EC7O05	Electronic Measurements and Instrumentation	ECE
13	201EC7O06	Sensors and Actuators	ECE
14	201CS7O03	Introduction to Machine Learning	CSE
15	201CS7O04	Cloud Computing	CSE
16	201IT7O02	Deep Learning	IT
17	201IT7O03	Data Science	IT
18	201PT7O03	Fluidization Engineering	PT
19	201PT7O04	Fundamentals of Mechanical Unit Operations	PT
20	201MI7O02	Drilling & Blasting	Min.E
21	201AG7O02	Agricultural Structures and Protected Cultivation	Ag.E

HONORS PROGRAM						
Specialization: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING						
S.No.	Course Code	COURSE TITLE	L	T	P	SEMESTER
1.	201CS4H01	Soft Computing Techniques	3	1	0	4
2.	201CS5H01	Natural Language Processing	3	1	0	4
3.	201CS6H01	Reinforcement Learning	3	1	0	4
4.	201CS7H01	Data Visualization	3	1	0	4
Specialization: NETWORKS AND SECURITY						
S.No.	Course Code	COURSE TITLE	L	T	P	SEMESTER
1.	201CS4H02	Internet of Things	3	1	0	4
2.	201CS5H02	Computational Number Theory	3	1	0	4
3.	201CS6H02	Information Security Analysis and Audit	3	1	0	4
4.	201CS7H02	Principles of Cyber Security	3	1	0	4
MINOR PROGRAM						
1.	201CS4M01	Data Structures	3	1	0	4
2.	201CS4M02	Software Engineering	3	1	0	4
3.	201CS4M03	Computer Organization and Architecture	3	1	0	4
4.	201CS5M01	Computer Networks	3	1	0	4
5.	201CS5M02	Database Management Systems	3	1	0	4
6.	201CS5M03	Internet of Things	3	1	0	4
7.	201CS6M01	Operating Systems	3	1	0	4
8.	201CS6M02	Web Technologies	3	1	0	4
9.	201CS6M03	Introduction to R programming	3	1	0	4
10.	201CS7M01	Principles of Cyber Security	3	1	0	4
11.	201CS7M02	Introduction to Machine Learning	3	1	0	4
12.	201CS7M03	Cloud Computing	3	1	0	4

COMMUNICATIVE ENGLISH

(Common to all branches)

I Semester
Course Code:201HS1T01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1: Identify the ways to overcome fear and use words contextually, Interpret the developing conditions and the core competencies of the state to prioritize the education system.
- CO2: Explain about world's most precious natural resources.
- CO3: Explain the importance of unity to abolish war.
- CO4: Respond well to the changing situations in life within dependent knowledge for better decision making.
- CO5: Demonstrate writing and concepts of effective writing skills.
- CO6: Construct sentences and paragraphs using the appropriate grammatical structure and correct word forms

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-

Unit – I

1. An Astrologers's Day - R.K.Narayan (Detailed)
2. Bade Bhai Saab – Munshi Premchand (Non-Detail)

Unit – II

1. Building A New State - A. P. J.Abdul Kalam
2. Morning Bells- Jayashree Mohan Raj (Non-Detail)

Unit – III

1. Water: The Elixir Of Life- C. V. Raman (Detailed)
2. The Power Of Plate Of Rice- Ifeoma Okoye (Non-Detail)

Unit – IV

1. The Woodrose-Abburi Chaya Devi (Detailed)
2. The Cop And The Anthem- O.Henry (Non-Detail)

Unit – V

1. Progress- St. John Ervine (Detailed)
2. Dial 000- Barry Rosenberg (Non-Detail)

Text Books:

1. 'Using English' by Orient Black Swan.
2. 'Life, language and Culture -Explorations' by Cengage.

Reference Books:

1. Objective English, Pearson Publications.
2. Effective English Communication, Tata Mc Graw-Hill Publishing.
3. Effective Technical English, Scitech.

Web Links:

1. <http://sittingbee.com/an-astrologers-day-r-k-narayan/>
2. <http://bbrenglishforall.blogspot.com/2014/01/building-new-state-study-material.%20html>
3. <https://www.literatureworms.com/2012/10/water-elixir-of-life-by-sircvraman.html>
4. <http://macon.hol.es/woodrose-abburu-chaya-devi.pdf>
5. <https://ardhendude.blogspot.com/2013/07/analysis-of-progress-by-st-john-ervine.%20html>

DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA

(Common to all branches)

ISemester
Course Code:201BS1T01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Apply the concepts of Mean Value theorem, Partial Differentiation and examine the maxima and minima of a given function.
- CO2: Solve the linear differential equations and model various situations involving differential equations of first order.
- CO3: Solve linear differential equations of higher order and model various situations involving second order differential equations.
- CO4: Calculate Rank of a matrix and solve the system of Linear equations.
- CO5: Calculate various powers of a matrix and identify the nature of the quadratic form.
- CO6: Calculate inverse of a matrix using Cayley – Hamilton theorem.

Mapping of Course Outcomes with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Unit - I

Differential Calculus: Rolle's theorem, Lagrange's theorem, Cauchy Mean Value theorem, Taylor's and Maclaurin's theorems (All theorems Without Proof).

Partial Differentiation: Euler's theorem (without proof), Total derivative, Chain rule, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobian, Functional dependence. Applications: Maxima and Minima of functions of several variables without constraints and with constraints (Lagrange's method).

Unit – II

Differential Equations of First Order: Introduction to differential equations, linear differential equation of first order - Bernoulli differential equation - Exact differential equations- Equations reducible to exact, Applications: Orthogonal trajectories, Newton's Law of cooling, RL circuit.

Unit – III

Linear Differential Equations of Second And Higher Order: Linear differential equations of higher order with constant coefficients, Complementary function and Particular integral with RHS term of the type polynomials in x, eax, sin ax, cos ax, eaxV(x), xV(x)- Method of Variation of parameters, Equations reducible to constant coefficients –Cauchy-Euler equation, Legendre's equation. Application: LCR Circuit

Unit – IV

System of Linear Equations, Eigen Values and Eigen Vectors: Definition of a Vector space, Linear dependence and independence of vectors, Rank of a matrix, Echelon form and Normal form, solving system of Homogenous and Non homogenous linear equations- Gauss Jordon elimination method, Eigen values, Eigen vectors, Properties of eigen values and eigen vectors (without proof). Applications: Free vibrations of a two mass system

Unit – V

Quadratic Forms: Cayley -Hamilton theorem (without proof), Inverse and powers of a matrix by using Cayley - Hamilton theorem, Diagonalization of a matrix, Quadratic forms, Reduction of quadratic form to canonical form using orthogonal transformation, Nature of the quadratic form.

Text Books:

1. Advanced Engineering Mathematics, R.K.Jain, S.R.K.Iyengar, Alpha Science Publications
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10thEdition, Wiley-India
3. Higher Engineering Mathematics, B.S.Grewal, 43rdEdition, KhannaPublishers.
4. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari, Pearson Publications

Reference Books:

1. Advanced Engineering Mathematics, D.G.Zill, MICHAIL R CULTER, 3rd Edition Norosa Publications2009.
2. Advanced engineering mathematics with MATLAB, Dean G. Duffy, CRCPress.
3. Advanced Engineering Mathematics, Peter O'neil, CengageLearning.
4. Advanced modern engineering mathematics, Glyn James, Pearson education.

Web Links:

1. <https://nptel.ac.in/courses/111106100/>
2. <https://nptel.ac.in/courses/111106100/>
3. <https://nptel.ac.in/courses/111106051/>
4. <http://mathworld.wolfram.com/>
5. <https://www.khanacademy.org/>
6. https://spoken-tutorial.org/tutorial-search/?search_foss=%20Scilab%20&%20search_%20language=English

ENGINEERING CHEMISTRY
(Common to ECE, CSE &IT)

ISemester
Course Code:201BS1T04

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Analyze the hardness of water and specification of drinking water
- CO2:** Outline the difference between primary and secondary cells
- CO3:** Summarize the fundamentals and applications of polymers.
- CO4:** Illustrate renewable and non renewable energy sources
- CO5:** Discuss properties and applications of modern materials
- CO6:** Summarize the importance of green chemistry

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	2	-	-	-	-	1
CO2	3	-	-	-	-	-	1	-	-	-	-	1
CO3	3	-	-	-	-	-	1	-	-	-	-	1
CO4	2	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	1	-	-	-	-	1
CO6	1	-	-	-	-	-	2	-	-	-	-	-

Unit - I

Introduction –Soft Water and hardness of water, types of hardness of water, degree of hardness of water, Units of hardness of water, problems on hardness, Boiler troubles - scale and sludge, Boiler corrosion, Industrial water treatment- zeolite and ion-exchange processes. Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization(WHO) standards, - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

Unit – II

Electrochemical Energy Systems: Introduction-Electrochemical Cell(Galvanic cell), Electrochemical series, Applications,single electrode potential,Hydrogen and Calomel electrode,Nernst Equation for a single electrode ,Concentration Cells(Electrode & Electrolyte),Construction of glass electrode. Batteries – Classical batteries-dry/Leclanche cell,Modern batteries-zinc air, lithium cells-Li MnO₂ cell- challenges of battery technology.Fuel cells- Introduction classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell-Merits of fuel cell

Unit – III

Polymer Chemistry: Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation (Free radical mechanism for addition polymerization) Plastics - Thermoplastics and Thermosetting, Preparation, properties and applications of – PE, PVC, Bakelite, Teflon and Nylon-6, 6. Elastomers–Buna-S, Buna-N–preparation, properties and applications. Conducting polymers – polyacetylene, polyaniline – mechanism of conduction and applications.

Unit – IV

Energy Sources And Applications: Introduction- sources of renewable energy –Hydro power, Biomass and Biofuels Solar energy – Introduction -Physical and Chemical properties of Silicon-Preparation of Semiconductors - Doping of Silicon-p and n type semiconductors- PV cell / solar cell- Working &Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy. Fuels: Introduction- classification- liquid fuels- Refining of petroleum-cracking Reforming-Gaseous fuels-LPG & CNG Applications

Unit – V

Material Science and Engineering: Nanomaterial: Introduction to nanomaterial: nanoparticles, Nano cluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterial's: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM). Nanotubes: Carbon Nano tubes- Types of CNT's-preparation methods –Arc discharge, Laser ablation and chemical vapour deposition –properties and applications. Green Chemistry: Introduction, principles of green chemistry (Ex: Solvent, Catalyst, Reactant) BAND THEORY OF SOLIDS:Introduction –Explanation of conductors, semiconductors, Insulators by Band Theory- Super conductors-Types-Preparation Properties and Applications. APPENDIX: Introduction to Molecular Machines and Molecular Switches.

Text Books:

1. Engineering Chemistry, P.C. Jain and M. Jain, 16/e, Dhanapat Rai & Sons, (2014).
2. Engineering Chemistry, B.K. Sharma, KrishnaPrakasham, (2014).
3. Engineering Chemistry, Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai and sons, (2003).
2. A Text Book of Nano Science and Nanotechnology, B.S Murthy and P. Shankar, University Press (2013)
3. A Textbook of Engineering Chemistry, S.S. Dara, S.Chand& Co, (2010).
4. Material Science and Engineering, V.Raghavan, Prentice-Hall India Ltd, (2004).
5. A text book of Engineering Chemistry, N.Krishna Murthy and Anuradha, Murthy Publications (2014).

Web Links:

1. <http://www.nptelvideos.in/2012/11/chemistry-of-materials>
2. <http://www.nptelvideos.com/lecture.php?id=2946>
3. <http://www.nptelvideos.com/lecture.php?id=2922>
4. <http://www.nptelvideos.com/lecture.php?id=2954>

PROGRAMMING FOR PROBLEM SOLVING USING C

(Common to EEE, ECE, CSE, IT, AIML & CSE-DS)

I Semester
Course Code:201ES1T02

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate the fundamentals computer and basics of computer programming.
- CO2:** Make use of control structures and arrays for problem solving.
- CO3:** Develop modular programming using functions
- CO4:** Apply pointers for dynamic memory allocation
- CO5:** Discuss structures and unions to handle heterogeneous data
- CO6:** Demonstrate file handling using file operations.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO6	3	2	2	-	-	-	-	-	-	-	-	-

Unit - I

Computer History, Hardware, Software, Programming Languages and Algorithms: Components and functions of a Computer System, Concept of Hardware and Software Programming Languages: Low-level and High-level Languages, Program Design Tools: Algorithm, Flowchart, Pseudo code. Introduction to C Programming: Introduction, Structure of a C Program, Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/Output Statements, Operators, Type Conversion

Unit – II

Control Flow, Relational Expressions & Arrays: Conditional Branching Statements: if, if-else, if-else-if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement. Arrays: Introduction, Operations on Arrays, One dimensional Array, Two dimensional Array, Multi dimensional arrays.

Unit – III

Strings: String Fundamentals, String Processing with and without Library Functions. Functions: Introduction, Function Declaration, Function Definition, Function call, Categories of Functions, passing parameters to Functions, Arrays as Function Arguments, Scope of Variables, Variable Storage Classes, Recursion.

Unit – IV

Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function arguments, Pointers

and Arrays, Pointers and Strings, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command line Arguments.

Unit – V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type – enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Text Books:

1. Computer Programming, Reema Thareja, Oxford University Press.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

Reference Books:

1. C Programming – A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
3. Programming in C, Ashok Kamthane, 2 ndEdition, Pearson Education.
4. Programming in ANSI C, E. Balagurusamy, 4E, Tata Mc Graw-Hill Education, 2008.

Web Links:

1. <http://www.c4learn.com/>
2. <http://www.geeksforgeeks.org/c/>
3. <http://nptel.ac.in/courses/122104019/>
4. <http://www.learn-c.org/>
5. <https://www.tutorialspoint.com/cprogramming/>

COMPUTER ENGINEERING WORKSHOP
(Common to CSE, IT, AIML & CSE-DS)

I Semester
Course Code:201ES1I02

L T P C
 2 0 2 3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Identify the components of a PC, Assemble & disassemble the same.
- CO2:** Experiment with installation of Linux operating system, Virtual Machine and secure a computer from cyberthreats.
- CO3:** Illustrate Networking Commands and understand the concepts of Networking.
- CO4:** Develop webpages using HTML5 tags, CSS3 tags.
- CO5:** Prepare Word documents, excel sheets and presentations using office tools.
- CO6:** Summarize fundamentals and architecture of IoT.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	2	2	-	-
CO2	2	1	-	-	1	-	-	-	1	2	-	-
CO3	2	-	-	-	-	-	-	-	1	2	-	-
CO4	2	1	1	-	-	-	-	-	1	2	-	1
CO5	2	1	1	-	-	-	-	-	1	2	-	1
CO6	2	-	-	-	-	-	-	-	1	2	-	-

Unit - I

Computer Hardware: Identification of peripherals of a computer and block diagram of a computer, I/O devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds

Unit – II

Operating System: Setting up and configuring a new Virtual Machine, Setting up and configuring an existing Virtual Machine, Exporting and packaging an existing Virtual Machine into a portable format. Linux operating system commands: General command syntax, Basic help commands, Basic File system commands, Date and Time, Basic Filters and Text processing, Basic File compression commands, Miscellaneous: apt-get, vi editor.

Unit – III

Networking and Internet: Networking Commands: ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route, Internet Services: Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins , Antivirus installation, configuring a firewall, blocking pop-ups , Email creation and usage, Creating a Digital Profile on LinkedIn

Unit – IV

Productivity tools: HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties.

Unit – V

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices.

List of Experiments:**Week - 1**

Identification of peripherals of a computer

1. Block diagram of the CPU along with the configuration of each peripheral and its functions.

Week - 2

System Assembling and Disassembling

- 2.1) Disassembling the components of a PC.
- 2.2) Assembling the components back to working condition

Week - 3

Virtual Machine setup

- 3.1) Setting up and configuring a new virtual machine.
- 3.2) Setting up and configuring an existing virtual machine.
- 3.3) Exporting and packaging an existing virtual machine into a portable format.

Week - 4

. Installation of software's and basic commands

- 4.1) Installation of Linux operating Systems.
- 4.2) Basic Linux Operating System commands.

Week - 5

Networking and Internet

- 5.1) Networking commands.
- 5.2) Configuring Proxy and Firewall settings.
- 5.3) Exploring Internet and World Wide Web.
- 5.4) Exploring Search Engines, Cyber hygiene

Week - 6

Productivity Tools-I

- 6.1) Basic HTML tags
- 6.2) Introduction to HTML5 and its tags

Week - 7

Productivity Tools-II

7. Introduction to CSS3 and its properties.

Week - 8

Productivity Tools-III

8. Preparation of a simple homepage

Week - 9

IoT

9. A study experiment on IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Week - 10

Office tools-I

10. Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Week - 11

11. Office tools-II Demonstration and practice on i. Microsoft Word- Formatting, Page Borders, Reviewing, Equations, symbols. ii. Power Point- Features of power point, guidelines for preparing an effective Presentation. iii. Microsoft Excel- Organize data, usage of formula, graphs and charts.

Week - 12

- 12. Office tools-III
 - 12.1) Installation of LaTeX and related Software's.
 - 12.2) Basic formatting using LaTeX.
 - 12.3) Handling the equations in LaTeX.
 - 12.4) Inserting the Tables in LaTeX.

List of Augmented Experiments:

- 1. Develop the web site for Hospital Management System
- 2. Prepare a power point presentation for college information (Include 10 slides)
- 3. List the common computer hardware problem and write down the solutions.

Text Books:

- 1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
- 2. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.

Reference Books:

- 1. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

Web Links:

- 1. <https://assembleyourpc.net/>
- 2. <https://www.latex-tutorial.com/tutorials>
- 3. <http://www.teachmsoffice.com/>
- 4. <https://www.coursera.org/specializations/iot>

COMMUNICATIVE ENGLISH LAB

Common to all branches

I Semester
Course Code:201HS1L01

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO 1: Make use of the concepts to communicate confidently and competently in English Language in all spheres.
- CO2: Express Creative skills to construct Dialogues/Conversations in Spoken and Written forms.
- CO3: Identify Accent for intelligibility.
- CO4: Demonstrate communicative ability in everyday Conversation, JAM sessions and Public Speaking.
- CO5: Demonstrate nuances of Language through Audio–Visual Experience and group activities.
- CO6: Apply their linguistic competence in all LSRW skills to professional and personal settings.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	-
CO6	-	-	-	-	-	-	-	-	2	3	-	-

Practice – 1

- A. Greeting, Introducing, and Taking leave
- B. Pure Vowels

Practice – 2

- A. Giving Information and Asking for Information
- B. Diphthongs

Practice – 3

- A. Inviting, Accepting and Declining Invitations
- B. Consonants

Practice – 4

- A. Commands, Instructions and Requests
- B. Accent and Rhythm

Practice – 5

- A. Suggestions and Opinions
- B. Intonation

Reference Books:

1. Strengthen your Communication Skills by Dr.M.Hari Prasad, Dr.SalivendraJ.Raju and Dr.G.Suvarna Lakshmi, Maruthi Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. A Hand book of English for Professionals by Prof Eliah, B.S Publications.
4. Effective Technical Communication by M.Ashraf Rizvi, Tata McGraw-Hill Publishing Company
5. Word power made handy, Dr. Shalini verma, S.Chand Company.

Web Links:

1. <https://fauzigeneraloflostsga.wordpress.com/b-inggris/bab-2/>
2. <https://www.lawlessenglish.com/learn-english/pronunciation/vowels-phonetics/>
3. <https://www.english-at-home.com/giving-personal-information/>
4. <https://englishpost.org/make-accept-decline-invitations/>
5. <https://www.ef.com/ca/english-resources/english-grammar/reported-speech-orders-requests-suggestions/>

ENGINEERING CHEMISTRY LAB
(Common to ECE, CSE & IT)

I Semester Course Code: 201BS1L03	L 0	T 0	P 3	C 1.5
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Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Analyze and improve the experimental skills.
- CO2:** Summarize different water samples
- CO3:** Analyze the strength of acids by instrumentation.
- CO4:** Apply polymerization techniques in the preparation of polymers.
- CO5:** Summarize the quantitative analysis of Vitamin-C
- CO6:** Prepare alternative fuel like Bio-Diesel

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	2	-	-	-
CO2	2	-	-	-	-	-	-	-	2	-	-	1
CO3	1	-	-	-	-	-	-	-	2	-	-	-
CO4	2	-	-	-	-	-	-	-	2	-	-	1
CO5	1	-	-	-	-	-	-	-	2	-	-	-
CO6	2	-	-	-	-	2	1	-	2	-	-	-

List of Experiments (Any ten experiments from the following):

1. Determination of Total Hardness of a water sample.
2. Determination of Dissolved Oxygen in Water Sample.
3. Determination of Zinc by Complexometric method
4. P^{H} metric titration of (i) strong acid vs. strong base.
5. Determination of Fe (II) in Mohr's salt by potentiometric method.
6. Potentiometry – Titration between strong acid – strong base
7. Conductometric titrations (Strong acid vs Strong base)
8. Preparation of Phenol- Formaldehyde resin
9. Preparation of Urea-Formaldehyde resin.
10. Determination of Vitamin – C.

List of Augmented Experiments:

(Any two of the following experiments can be performed)

11. Preparation of bio diesel.
12. Determination of acid value and saponification value of a given lubricant.
13. Determination of viscosity of a liquid.
14. Estimation of Calcium in port land Cement.
15. Determination of percentage Moisture content in a coal sample.

Reference Books:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr.JyotsnaCherukuris (2012) Laboratory Manual of engineering chemistry-II, VGS Techno Series.
3. Chemistry Practical Manual, Lorven Publications K. Mukkanti (2009). Practical Engineering Chemistry, B.S. Publication.

PROGRAMMING FOR PROBLEM SOLVING USING C LAB
(Common to EEE, ECE, CSE, IT, AIML & CSE-DS)

I Semester
Course Code:201ES1L02

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Develop the basic programs in C and draw the flowcharts using Raptor.
- CO2:** Implement control structures and arrays for problem solving.
- CO3:** Develop modular programming using functions
- CO4:** Apply pointers for dynamic memory allocation
- CO5:** Make use of structures and unions to handle heterogeneous data
- CO6:** Apply file operations for file handling.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	3	-	-	-	1	2	-	2
CO2	1	2	3	1	-	-	-	-	1	2	-	2
CO3	2	2	3	1	-	-	-	-	1	2	-	2
CO4	2	3	2	1	-	-	-	-	2	2	-	1
CO5	3	2	2	1	-	-	-	-	2	2	-	2
CO6	3	2	2	1	-	-	-	-	2	2	-	2

1. Introduction to C Programming

- 1.1) Basic Linux Commands
- 1.2) Exposure to Turbo C, Vi, Emacs, Code Blocks IDE, Dev C++
- 1.3) Writing simple programs using printf(), scanf()

2. Raptor

- 2.1) Installation and Introduction to Raptor.
- 2.2) Draw a flow chart to find the Sum of 2 numbers.
- 2.3) Draw a flow chart to find Simple interest.

For the following experiments, develop flow charts using Raptor and implement C programs to:

3. Basic Math

- 3.1) Convert Celsius to Fahrenheit and vice versa.
- 3.2) Find largest of three numbers using ternary operator.
- 3.3) Calculate area of a Triangle using Heron's formula.

4. Control Flow- I

- 4.1) Find Whether the Given Year is a Leap Year or not.
- 4.2) Find the roots of a Quadratic Equation.
- 4.3) Make a simple Calculator to Add, Subtract, Multiply or Divide Using switch...case.

5. Control Flow- II

- 5.1) Find Whether the Given Number is Prime number or not
- 5.2) Find Whether the Given Number is Armstrong Number or not.
- 5.3) Print Floyd Triangle.

6. Control Flow- III

- 6.1) Find the sum of individual digits of a positive integer.
- 6.2) Check whether given number is palindrome or not.
- 6.3) Read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\dots+x^n$.

7. Arrays

- 7.1) Search an element in the given array (Linear Search)
- 7.2) Perform matrix addition.
- 7.3) Perform matrix multiplication.

8. Strings

- 8.1) Implementation of string manipulation operations with library function.
 - a) copy
 - b) concatenate
 - c) length
 - d) compare
- 8.2) Implementation of string manipulation operations without library function.
 - a) copy
 - b) concatenate
 - c) length
 - d) compare
- 8.3) Verify whether the given string is a palindrome or not

9. Functions, Array & Pointers

- 9.1) Demonstrate parameter passing in Functions.
- 9.2) Find Fibonacci, Factorial of a number with Recursion and without Recursion.
- 9.3) Find the sum of given numbers with arrays and pointers.

10. Pointers

- 10.1) Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.
- 10.2) Find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- 10.3) Find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

11. Structures

- 11.1) Store Information of a book Using Structure
- 11.2) Add Two Complex Numbers by Passing Structure to a Function

12. Files

- 12.1) Open a file and to print the contents of the file on screen.
- 12.2) Copy content of one file to another file.
- 12.3) Merge two files and store content in another file.

LIST OF AUGMENTED EXPERIMENTS:

13 to 16 (Any 2 of the following experiments can be performed)

13. Atm Pin Generation:

Aditya purchased a credit card. He has to generate a PIN number to access the ATM and Net banking for which OTP was sent to his registered mobile number. Using this OTP number he has to generate ATM PIN number. After generating PIN number, he can use it for further transactions. Maximum login he can make is 3 times.

Sample Input:

OTP: 6732

If valid

Enter PIN: 8858

Confirm your PIN: 8858

Sample output:

valid/Invalid

PIN generated successfully.

Note: OTP is hard coded.

14. Reset Password:

Aditya was using Syndicate Bank's Online Account. She wanted to pay her bills through Online. But she forgets her password. Now she has to reset the password. For resetting the password, she has to select reset option from the Menu.

NOTE: using switch case.

Sample input:

Fast withdrawal

Mini Statement

Balance Enquiry

Reset Password Enter your choice: 4

Sample Output:

Reset password: New password: ***** Confirm password: *****

15. Student Attendance Report Generation:

Some of the school staff had failed to maintain the attendance of the students, causing lack of essential records related to students attendance that should be submitted in a parents meet. The school management has decided to automate the process in order to maintain the attendance of every student effectively. You are asked to write a program to the above scenario and display whether the student is allowed to write the Exam or not.

Percentage<65	Detained
>=65 and <75	should pay condonation to appear for Exams
>=75	Allowed for exams

Sample Input:

Enter no of students: 5

Enter Students Details:

Rno:1	Name:Kalyan	Attendance(%): 67	Should pay condonation to appear for exams
Rno:2	Name: Laxman	Attendance(%): 56	
Rno:3	Name: Yamini	Attendance(%): 79	
Rno:4	Name: Aryan	Attendance(%): 60	
Rno:5	Name: Raghav	Attendance(%): 88	

Sample output:

Rno	Name	Attendance (%)	Remarks
1	Kalyan	67	67 should pay condonation to appear for Exams
2	Laxman	56	detained
3	Yamini	79	allowed for Exams
4	Aryan	60	detained
5	Raghav	88	allowed for Exams

16. Library Management

Shilpa is a student of PGEC got the Library Card. She wants to lend the books from the Library. The college gave two cards to each and every student. The students can lend only two books at a time and it has to be returned back after 15 days. If the books are not returned late fee will be collected for no. of days the books were returned after the due date. Late fee per day is Rs.50/-

Sample output:

Enter the name of student: nalini

Enter the Roll No.:555

Enter the branch: cse

Enter the section: A

Enter the year: 3

Enter the Date of Lend (dd mm yyyy) : 08 08 2017

Enter the Date of return (dd mm yyyy): 09 10 2017

The no. of days book used by the student = 62

Extra days used by the student = 47

Late return fine fee = 2350

Reference Books:

1. Let Us C Yashwanth Kanetkar, Eighth edition, BPB Publications.
2. Programming in C A-Practical Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.

Web Links:

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>
5. <https://raptor.martincarlisle.com/>
6. <https://nptel.ac.in/courses/106105085/2>

ENVIRONMENTAL SCIENCE
(Common to all branches)

I Semester
Course Code:201MC1T01

L T P C
2 0 0 0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Outline the natural resources and their importance for the sustenance of the life
- CO2:** Explain about the biodiversity of India, threats and its conservation methods
- CO3:** Illustrate various attributes of the pollution, impacts and measures to control the pollution along with waste management practices
- CO4:** Describe social issues of both rural and urban environment to combat the challenges and the legislations of India in environmental protection
- CO5:** Explain the population growth and its implications
- CO6:** Summarize the Role of IT on Environment and Human Health

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	2	-	-	-	-	-
CO2	1	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	2	3	-	-	-	-	1
CO4	-	-	-	-	-	1	3	1	-	-	-	1
CO5	-	-	-	-	-	-	3	-	-	-	-	-
CO6	-	-	-	-	-	1	3	-	-	-	-	1

Unit – I

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance, Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems.

Unit – II

Ecosystem, Biodiversity and Its Conservation:

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers, and decomposers. Food chains, food webs and ecological pyramids.

Biodiversity And Its Conservation: Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Values of biodiversity. Hot-spots of biodiversity – Threats to biodiversity. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – III

Environmental Pollution and Solid Waste Management:

Environmental Pollution: Definition, Cause, effects, and control measures of:

- a. Air Pollution.
- b. Water Pollution
- c. Soil Pollution
- d. Marine Pollution

e. Noise Pollution

Solid Waste Management:

Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution

Unit – IV

Social Issues and The Environment:

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to Energy & Water. Resettlement and rehabilitation of people, Environmental ethics, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, and holocaust. Environment Protection Act – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act-Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit – V

Human Population and The Environment: Population growth, variation among nations. Environment and human health, Human Rights, Value Education. Role of Information Technology in Environment and human health.

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company.

Reference Books:

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Textbook of Environmental Sciences and Technology by M.Anji Reddy, B.S Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice Hall of India Private limited.
5. A Textbook of Environmental Studies by G.R.Chatwal, Himalaya Publishing House

Web Links:

1. <https://www.youtube.com/watch?v=mOwyPENHhbc>
2. https://www.youtube.com/watch?v=_mgvsPnCYj4
3. <https://www.youtube.com/watch?v=L5B-JMnBIyQ>
4. https://www.youtube.com/watch?v=3RDGV5i82_Q

NUMERICAL METHODS AND COMPLEX VARIABLES
(Common to CSE , IT, AIML& CSE(DS))

IISemester
Course Code:201BS2T07

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply numerical methods to obtain approximate solution of equations.
- CO2:** Apply various numerical methods to interpolate polynomials.
- CO3:** Apply numerical methods to initial value problems and problems involving integration.
- CO4:** Examine the analyticity of functions of complex variables.
- CO5:** Apply Cauchy's theorem, Cauchy's integral formula and Cauchy's residue theorem.
- CO6:** Compute Taylor's series and Laurent's series.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Unit – I

Solution of Algebraic and Transcendental Equations: Introduction to Numerical methods, Bisection method, Secant method, Method of false position, Iteration method, Newton - Raphson method

Unit – II

Interpolation: Introduction to Interpolation, Finite differences, Forward differences, Backward differences, Relation between operators, Newton's formula for interpolation, Lagrange's interpolation, Newton's divided difference interpolation

Unit – III

Numerical Integration and solution of Ordinary Differential equations:Trapezoidal rule, Simpson's 1/3rdand 3/8thrule, Solution of ordinary differential equations by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method, Runge - Kutta method (fourth order).

Unit – IV

Functions of Complex variables: Introduction, Continuity, Differentiability, Analyticity, Properties of analytic functions, Cauchy-Riemann equations in Cartesian and polar co-ordinates, Harmonic functions, Milne Thompson method.

Unit – V

Complex Integration: Introduction to complex integration, Cauchy's integral theorem, Cauchy integral formula, Liouville's theorem, Taylor's series, Maclaurin's series, Laurent's series (All theorems without proof), Singular point, Types of singularities-Isolated, Essential and Removable singularities, pole of order m, Residues, Cauchy Residue theorem

Text Books:

1. Advanced Engineering Mathematics, R.K.Jain, S.R.K.Iyenkar, Alpha Science Publications.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10thEdition, Wiley India
3. Higher Engineering Mathematics, B.S.Grewal,43rdEdition, KhannaPublishers.
4. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari, Pearson Publications.

Reference Books:

1. Advanced engineering mathematics with MATLAB, Dean G. Duffy, CRCPress
2. Higher Engineering Mathematics, Dass H.K., Rajnish Verma. Er., S. Chand Co. Pvt. Ltd,Delhi.
3. Higher engineering mathematics by John Bird, 5thedition Elsevier Limited,2006.

Web Links:

1. <https://nptel.ac.in/courses/111107108/25>
2. <https://nptel.ac.in/courses/111107108/25>
3. <https://nptel.ac.in/courses/111107105/>
4. <http://mathworld.wolfram.com/>
5. <https://www.khanacademy.org/>

APPLIED PHYSICS
(Common to ECE, CSE, IT& AIML)

II Semester
Course Code:201BS2T09

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1** Identify the applications of Interference and diffraction in Engineering.
- CO2** Explain the fundamental concepts of Quantum behavior of matter.
- CO3** Differentiate various electron theories to understand the properties of solids.
- CO4** Illustrate the basic concepts of Semi-Conductors to identify their types.
- CO5** Explain the magnetic properties of different materials.
- CO6** Summarize various types of polarizations in dielectrics.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	2	2	-	-	-	-	-	-	-	-	-	-

Unit – I

Wave Optics: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry). Diffraction – Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Doubleslit, N -slits and circular aperture (qualitative) – Intensity distribution curves - DiffractionGrating– Grating spectrum – missing order– Resolving power – Rayleigh's criterion - Resolving power of Telescope, Microscope, Grating.

Unit – II

Quantum Mechanics: Introduction – Matter waves – de Broglie's hypothesis – Davisson- Germer experiment – G.P.Thomson experiment – Heisenberg's Uncertainty Principle – interpretation of wave function – Schröedinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit – III

FreeElectronTheory:Introduction–Classicalfreeelectrontheory(meritsanddemeritsonly)- QuantumFreeelectrontheory–electricalconductivitybasedonquantumfreeelectrontheory– Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy -Density of states.

BAND THEORY OF SOLIDS Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m^* Vs K diagram - concept of hole.

Unit – IV

Semiconductor Physics: Introduction– Intrinsic semi-conductors - density of charge carriersElectrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation

Unit – V

Magnetism: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of FerromagnetismHysteresis – soft and hard magnetic materials – applications of Ferromagnetic material. Dielectrics:Introduction-Dielectric polarization–DielectricPolarizability,Susceptibilityand Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossotti equation - Frequency dependence of polarization – Applications of dielectrics.

Text Books:

1. “ A Text book of Engineering Physics” by M N Avadhanulu, P G Kshirsagar & T.V.S.Arun Murthy S Chand & Company Ltd, 11th edition.
2. “Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press(2015).
3. “Engineering Physics” by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books:

1. “Engineering Physics” by M.R.Srinivasan, New Age international publishers(2009).
2. “Optics” by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3. Engineering Physics by Mani naidu – Pearson Publications –2017.

Web Links:

1. <http://nptel.ac.in/courses/122107035/11>
2. <http://nptel.ac.in/courses/115102023/>
3. <https://phet.colorado.edu/en/simulations/category/physics>
4. <http://physicsgecg.blogspot.in/p/reading-materials.html>
5. <https://sites.google.com/site/physicsbysureshsaganti/home>

COMPUTER ORGANIZATION
Common to CSE & IT

II Semester
Course Code:201ES2T11

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1** Recognize and manipulate representation of numbers stored in digital computers
- CO2** Relate postulates of Boolean algebra, Shannon's expansion theorem and minimize combinational functions.
- CO3** Relate postulates of Boolean algebra, Shannon's expansion theorem and minimize combinational functions.
- CO4** Explain the basic computer organization , hardware design and introduction of Hardware Descriptive Language.
- CO5** Discuss the internal organization of computers, CPU, Memory unit and semiconductor based FLASH memory and Input or Outputs and the relations between its main components
- CO6** Discuss the internal organization of computers, CPU, Memory unit and semiconductor based FLASH memory and Input or Outputs and the relations between its main components

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	1
CO3	3	2	1	1	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1
CO6	3	1	1	-	-	-	-	-	-	-	-	1

Unit - I

Digital Components and Data Representation: Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code. Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation. Boolean Algebra and Logical gates: Boolean Algebra :Theorems and properties, Boolean functions, canonical and AR20 Computer Science and Engineering Aditya Engineering College (A) 39 standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps ;Logical gates ,universal gates and Two-level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

Unit - II

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Integrated NAND-NOR Gates, Multifunction gates, Multi-bit adder, Multiplexers, Demultiplexers, Decoders. Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flipflops; Synchronous counters; Shift Registers; Ring counters

Unit – III

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations. Register Transfer language and microinstructions :Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

Unit – IV

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit. Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Unit – V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory. Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access.

Text Books:

1. Digital Logic and Computer Design, Morris Mano, Pearson Education, 11th Edition.
2. Computer System Architecture, M.MorrisMano, PHI, 3rd edition.

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006.
2. Computer Organization, Hamacher, Vranesic and Zaky, TMH, 5th edition, 2002
3. Computer Organization & Architecture: Designing for Performance, William Stallings, PHI, 7th edition, 2006.

Web Links:

1. <http://nptel.ac.in/courses/106106092/>
2. <http://nptel.ac.in/courses/106103068/2>
3. <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>
4. <https://www.geeksforgeeks.org/computer-arithmetic-set-1/>
5. https://onlinecourses.nptel.ac.in/noc20_ee11/preview

PYTHON PROGRAMMING

(Common to CSE , IT, AIML & CSE-DS)

II Semester
Course Code:201ES2T04

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop programs using fundamentals of python
- CO2:** Make use of control statements and strings for developing applications
- CO3:** Develop applications using data structures and functions
- CO4:** Apply OOPs concepts and files for developing programs
- CO5:** Illustrate Exception Handling to handle runtime errors.
- CO6:** Build applications using GUI.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	-	1	-	-	-	-	-	-	2
CO2	2	2	3	-	1	-	-	-	-	-	-	2
CO3	2	2	2	-	1	-	-	-	-	-	-	2
CO4	2	2	2	-	1	-	-	-	-	-	-	2
CO5	2	1	2	-	1	-	-	-	-	-	-	2
CO6	2	1	3	-	1	-	-	-	-	-	-	2

Unit - I

Programming: Introduction to Programming Concepts with Scratch
Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops

Unit – II

Control Statement: Definite iteration for Loop
Formatting Text for output, Selection if and if else Statement
Conditional Iteration The While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files

Unit – III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function. Modules: Modules, Standard Modules, Packages

Unit – IV

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading

operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Unit – V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI - Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Text Books:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2018
2. Beginning Python: from Novice to Professional, Lie Hetland, Magnus, 2nd Edition, 2005

Reference Books:

1. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2017.
3. Think Python, Allen Downey, Green Tea Press,2012 .
4. Python for Everybody Exploring Data in Python 3, Charles Russell Severance, Sue Blumenberg.

Web Links:

1. <https://www.python.org/>
2. <https://www.coursera.org/courses?query=Python%20programming>
3. <https://www.learnpython.org/>
4. https://www.tutorialspoint.com/python3/python_tutorial.pdf
5. <http://www.geeksforgeeks.org/Python>

DATA STRUCTURES THROUGH C

(Common to EEE, CSE, IT, AIML & CSE-DS)

II Semester
Course Code:201ES2T07

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Interpret performance of a given algorithm
- CO2:** Apply searching and sorting techniques for problem solving
- CO3:** Make use of linear data structures for problem solving
- CO4:** Develop applications using Tree Data Structures.
- CO5:** Discuss basic concepts of Graphs to handle nonlinear data.
- CO6:** Solve problems using Graph Algorithms

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	-	-	-	-	-	-	-	-	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2
CO3	1	1	3	-	-	-	-	-	-	-	-	2
CO4	1	2	3	-	-	-	-	-	-	-	-	2
CO5	1	3	2	-	-	-	-	-	-	-	-	2
CO6	1	2	3	-	-	-	-	-	-	-	-	2

Unit - I

Data Structures –Definition, Classification and Operations on Data Structures, Pseudo code, Algorithm analysis, Time and Space Complexity. Searching: Linear search, Binary search. Sorting: Insertion Sort, Selection Sort, Exchange (Bubble Sort, Quick Sort),merging (Merge sort), distribution (Radix Sort) algorithms

Unit – II

Stacks: Introduction, Array Representation of Stacks, Operations and Implementation, Applications of Stacks-Reversing list, Infix to Postfix Conversion, Evaluating Postfix Expressions. Queues: Introduction, Array Representation of Queues, Operations and Implementation, Types of Queues: Circular Queues, Deques and Priority Queues, Application of Queues

Unit – III

Linked Lists: Introduction, Singly linked list, Operations on Singly Linked list - Insertion, Deletion and Searching, Doubly linked list - Insertion, Deletion, Circular linked list-Insertion, Deletion, Linked Representation of Stacks and Queues, Applications of Linked lists-Addition of Polynomials, Sparse Matrix Representation using Linked List

Unit – IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists, Traversing a Binary Tree(In-Order, Pre-Order,Post-Order). Binary Search Trees: Definition, Operations: Searching, Insertion, Deletion, Applications Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations

Unit – V

Graphs: Introduction, Graph Terminology, Representation of Graphs-Adjacency Matrix and using Linked list, Graph Traversals(BFT & DFT), Applications-Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's Shortest Path, Warshall's Algorithm, Transitive Closure. (Algorithmic Concepts Only, No Programs required).

Text Books:

1. Data Structures Using C, Reema Thareja, Oxford University Press, 2nd Edition.
2. Data Structures and Algorithm Analysis In C, Mark Allen Weiss, 2nd Edition.

Reference Books:

1. Fundamentals of Data Structure in C, Horowitz, Sahni, Anderson Freed, University Press, 2nd Edition, 2008.
2. Data Structures, Richard F. Gilberg, Forouzan, Cengage Learning, 2nd Edition.
3. Data Structures and Algorithms, G. A.V. Pai, TMH, 2008.

Web Links:

1. <http://nptel.ac.in/courses/106102064/>
2. <http://algs4.cs.princeton.edu/home/>
3. https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf
4. <http://www.udacity.com/>
5. <http://www.courseera.com/>

APPLIED PHYSICS LAB

II Semester
Course Code:201BS2L04

L T P C
0 0 3 1.5

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Use spectrometer, travelling microscope for making measurements.
 - CO2: Determine energy gap, break down voltage of a semiconductor.
 - CO3: Estimate thermal coefficient of a thermistor using characteristic curves.
 - CO4: Determine the young's modulus and resistivity.
 - CO5: Determine the wavelength of unknown source using lasers.
 - CO6: Calculate the strength of magnetic field and resolving power.

Mapping of Course Outcomes with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	-	-	-	1	-	-	-
CO3	2	1	-	-	-	-	-	-	1	-	-	-
CO4	2	2	-	-	-	-	-	-	1	-	-	-
CO5	2	1	-	-	-	-	-	-	1	-	-	-
CO6	1	2	-	-	-	-	-	-	1	-	-	-

LIST OF EXPERIMENTS

(Any ten of the following listed experiments)

Exp1

Determination of wavelength of a source-Diffraction Grating-Normal incidence.

Exp2

Newton's rings – Radius of Curvature of Plano – Convex Lens.

Exp3

Determination of thickness of a spacer using wedge film and parallel interference fringes.

Exp4

Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

Exp5

Energy Band gap of a Semiconductor p – n junction diode.

Exp6

Characteristics of Thermistor – Temperature Coefficients.

Exp7

Determination of resistivity of semiconductor by Four probe-method.

Exp8

Determination of V-I characteristics and Breakdown voltage of Zener Diode.

Exp9

Resolving power of diffraction grating.

Exp10

Resolving power of telescope.

LIST OF AUGUMENTED EXPERIMENTS**Exp11**

Determine the Young's Modulus of the material of the bar subjected to uniform bending.

Exp12

Determine the Young's Modulus of the material of the bar subjected to non- uniform bending.

Exp13

V-I characteristics of P-N junction Diode.

Reference Books:

1. Engineering Physics Lab Manual by Dr.C.V.Madhusudhana Rao, V.Vasanth Kumar, Scitech Publications.
2. Laboratory Manual Cum Record for Engineering Physics I & II by Dr.Y.Aparna, Dr.K.Venkateswara Rao, VGSTechnoseries.

Web Links:

1. URL: www.vlab.co.in

DATA STRUCTURES THROUGH C LAB

(Common to EEE, CSE, IT, AIML & CSE-DS)

II Semester
Course Code:201ES2L06

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop programs using recursive functions.
- CO2:** Develop programs using searching and sorting techniques.
- CO3:** Develop programs for implementing operations on Stacks and Queues.
- CO4:** Implement operations on Linked Lists.
- CO5:** Analyze basic operations of Binary tree and Binary search tree to improve the efficiency.
- CO6:** Develop solution for problems using Graph Algorithms.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	-	-	-	-	1	1	-	-
CO2	2	1	2	2	-	-	-	-	1	1	-	1
CO3	2	1	2	2	-	-	-	-	1	1	-	1
CO4	2	1	2	2	-	-	-	-	1	1	-	1
CO5	2	1	2	3	-	-	-	-	1	1	-	1
CO6	2	1	2	2	-	-	-	-	1	1	-	1

List of Experiments:

For the following experiments use C program to implement,

1. Searching

- 1.1) Recursive and non recursive functions to performLinear search for a Key value in a given list.
- 1.2) Recursive and non recursive functions to performBinary search for a Key value in a given list.

2. Sorting-I

- 2.1) Bubble sort, to sort a given list of integers.
- 2.2) Insertion sort, to sort a given list of integers.
- 2.3) Selection sort, to sort a given list of integers.

- 3. Quick sort, to sort a given list of integers.

4. Sorting-II

- 4.1) Merge sort, to sort a given list of integers.
- 4.2) Radix sort, to sort a given list of integers.
- 5. Stack operations using arrays.

6. Stack operations to evaluate the postfix expression.
7. Queue operations using arrays.
8. Singly linked list and its operations.
9. Doubly linked list and its operations.

10. Linked Lists

- 10.1) Stack operations using Linked List.
- 10.2) Queue operations using Linked List
11. Binary tree traversals :inorder, preorder and postorder.
12. Binary Search Tree and its operations.

List of Augmented Experiments:

(Any 2 of the following experiments can be performed)

13. Balanced brackets problem using stack. A bracket is considered to be any one of the following characters: (,), {, }, [, or]. Two brackets are considered to be a matched pair if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e.,], or }) of the exact same type.
14. Simplify an algebraic string of characters having '+', '-' operators and parenthesis.
You need to print the simplified equation without the parenthesis.
Example: Input: a-(b+c)
Output: a-b-c
15. Represent Sparse Matrices using Linked Lists.
16. Towers of Hanoi Problem. Tower of Hanoi is a mathematical puzzle where we have three rods and n disks. The objective of the puzzle is to move the entire stack to another rod, obeying the following simple rules:
 - a) Only one disk can be moved at a time.
 - b) Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack or on an empty rod.
 - c) No larger disk may be placed on top of a smaller disk.

Reference Books:

1. Data Structures And Algorithm Analysis In C, Mark Allen Weiss,2nd Edition.
2. Data Structures And Algorithms.A.V.Pai,TMH,2008.
3. Data Structures With C,SeymourLipshutz, TMH.

Web Links:

1. <http://nptel.ac.in/courses/106102064/>
2. <http://www.udacity.com/>
3. <http://www.courseera.com/>
4. <http://www.geeksforgeeks.org/data-structures/>
5. <http://www.studytonight.com/data-structures/>

PYTHON PROGRAMMING LAB

(Common to CSE , IT, AIML & CSE-DS)

II Semester
Course Code:201ES2L14

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop programs using python fundamentals
- CO2:** Make use of control statements and strings for developing applications
- CO3:** Develop applications using data structures and functions
- CO4:** Apply OOPs concepts and files for developing programs
- CO5:** Make use of Exception Handling to handle runtime errors.
- CO6:** Build applications using GUI.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	2	-	-	-	1	1	-	2
CO2	2	2	3	1	2	-	-	-	1	1	-	2
CO3	2	2	2	1	2	-	-	-	1	1	-	2
CO4	2	2	2	1	2	-	-	-	1	1	-	2
CO5	2	1	2	1	2	-	-	-	1	1	-	2
CO6	2	1	2	1	2	-	-	-	1	1	-	2

List of Experiments:

1. Basic Programs
 - 1.1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
 - 1.2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
2. Control Flow
 - 2.1) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
 - 2.2) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times
3. Control Flow Continued
 - 3.1) Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```

*
**
***
****
```

- 3.2) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 3.3) Write a program that asks the user for two numbers and prints Close if the

numbers are within .001 of each other and Not close otherwise.

4. Strings

4.1) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

4.2) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print out AaBbCcDdEe

4.3) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 10000000, the output should be 1,000,000.

4.4) In algebraic expressions, the symbol for multiplication is often left out, as in $3x+4y$ or $3(x+5)$. Computers prefer those expressions to include the multiplication symbol, like $3*x+4*y$ or $3*(x+5)$. Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

5. Data structure

5.1) Write a program that generates a list of 20 random numbers between 1 and 100.

(a) Print the list.

(b) Print the average of the elements in the list.

(c) Print the largest and smallest values in the list.

(d) Print the second largest and second smallest entries in the list

(e) Print how many even numbers are in the list.

5.2) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

5.3) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.

6. Data Structure-Continued

6.1) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

6.2) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists

6.3) Write a python script to perform following operations:

Create a matrix and print it

Perform Addition of 2 matrices

Perform multiplication of 2 matrices

7. Functions

7.1) Write a function called sum_digits that is given an integer num and returns the sum of the digits of num.

7.2) Write a function called first_diff that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.

7.3) Write a function called number_of_factors that takes an integer and returns how many factors the number has.

7.4) Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

8. Functions-Continued

8.1) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.

8.2) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

- 8.3) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
- (a) Do this using the sort method.
 - (b) Do this without using the sort method
- 8.4) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
9. Files
- 9.1) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
 - 9.2) Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
 - 9.3) Write a program to count frequency of characters in a given file.
10. OOP
- 10.1) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method get_price that receives the number of items to be bought and returns the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called make_purchase that receives the number of items to be bought and decreases amount by that much.
 - 10.2) Write a class called Time whose only field is a time in seconds. It should have a method called convert_to_minutes that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
 - 10.3) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
11. OOP Continued
- 11.1) Write a Python class to implement pow(x, n)
 - 11.2) Write a Python class to reverse a string word by word.
12. GUI & Exception Handling
- 12.1) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
 - 12.2) Write a program to demonstrate Try/except/else.
 - 12.3) Write a program to demonstrate try/finally and with/as.

List of AUGMENTED EXPERIMENTS

(Minimum of 2 experiments have to be performed)

13. Write a recursive python function which returns True if the input is well-formatted with respect to the list labels. Else it should return False.
- An input is a well-formatted with respect to the labels, if it follows below conditions:
- (a) input item is a list
 - (b) input item has length at least two
 - (c) input's first item is in the list labels
 - (d) each of the remaining items in input is either a string or a well-formatted list
- Refer the below table for possible of input items

Sample input

Expected output

input item	list label	
['VP', ['V', 'eat']]	['VP', 'V']	TRUE
['NP', ['N', 'a', 'or', 'b'], 'c']	['NP', 'V', 'N']	TRUE
[1, [2, 'oui', [1, 'no']], 'no']	[1,2]	TRUE
['VP', ['V', 'eat']]	['VP']	FALSE
['VP', ['V']]	['VP', 'V']	FALSE

Hangman

The Goal: Despite the name, the actual “hangman” part isn’t necessary. The main goal here is to create a sort of “guess the word” game. The user needs to be able to input letter guesses. A limit should also be set on how many guesses they can use. This means you’ll need a way to grab a word to use for guessing. (This can be grabbed from a pre-made list. No need to get too fancy.) You will also need functions to check if the user has actually inputted a single letter, to check if the inputted letter is in the hidden word (and if it is, how many times it appears), to print letters, and a counter variable to limit guesses.

14. Write a program to find the greatest number that can be formed by using given set of numbers.
15. Write a program to find sum of digits of a number till you get single digit sum.

Example:

Input : 142 (Hint: 1+4+2=7)

Output : 7

Input : 4683 (Hint: 4+6+8+3=21 =>2+1=3)

Output : 3

16. Write a program to count how many times each word present in a file.

Reference Books:

1. Python for Everybody Exploring Data in Python 3, Charles Russell Severance, SueBlumenberg, 2016
2. Learning Python, Mark Lutz, Orielly, 2013.
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2017

Web Links :

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>

PROFESSIONAL COMMUNICATION SKILLS LAB
Common to CE, EEE, ECE, CSE & IT

II Semester
Course Code:201MC2L01

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make effective use of Body language in all situations and contexts to enhance effective communication in all aspects.
- CO2:** Identify communicative competency to respond to others in different situations.
- CO3:** Make use of effective delivery strategies to select, compile and synthesize information for oral presentation.
- CO4:** Demonstrate in mock interviews, group discussion and public speaking.
- CO5:** Illustrate interpersonal skills using English language confidently and effectively for personal and professional growth.
- CO 6** Improve fluency and clarity in both spoken and written English.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	2	3	-	-
CO3	-	-	-	-	-	-	-	-	2	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	-
CO5	-	-	-	-	-	-	-	-	2	3	-	-
CO6	-	-	-	-	-	-	-	-	2	3	-	-

Practice – 1
Body Language

Practice – 2
Dialogues

Practice – 3
Presentation Skills

Practice – 4
Group Discussion

Practice – 5
Interviews and Telephonic Interviews

Practice – 6
Debates

Reference Books:

1. Strengthen your Communication Skills by Dr.M.Hari Prasad, Dr.SalivendraJ.Raju and Dr.G.Suvarna Lakshmi,Maruthi Publications.
2. English for Professionals by Prof Eliah,B.S Publications, Hyderabad
3. A Hand book of English for Professionals by Prof Eliah, B.S Publications.
4. Effective Technical Communication by M. Ashraf Rizvi, Tata Mcraw – Hill Publishing company.
5. Cornerstone,Developing soft skills,Pearson Education.

Web Links:

1. <https://edu.gcfglobal.org/en/business-communication/how-to-deescalate-an-argument-at-work/1/>
2. <https://www.youtube.com/watch?v=NNamZZsggM4>
3. <https://www.inc.com/guides/how-to-improve-your-presentation-skills.html>
4. <https://www.skillsyouneed.com/ips/interview-skills.html>
5. <https://www.sfu.ca/cmns/130d1/HOWTODEBATE.htm>

CONSTITUTION OF INDIA

(Common to all branches)

II Semester
Course Code:201MC2T02

L	T	P	C
2	0	0	0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1** Explain historical background of the constitution making and its importance for building a democratic India
- CO2** Compare the functioning of three wings of the government i.e., executive, legislative and judiciary
- CO3** Interpret the value of the fundamental rights and duties for becoming good citizen of India
- CO4** Compare the decentralization of power between central, state and local self-government
- CO5** Extend the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
- CO6** Understand the Electoral Process and Amendment procedure.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	-	1	2	-	-	-
CO2	-	-	-	-	-	2	-	1	3	-	-	-
CO3	-	-	-	-	-	3	-	2	3	-	-	-
CO4	-	-	-	-	-	3	-	2	1	-	-	-
CO5	-	-	-	-	-	2	-	1	3	-	-	-
CO6	-	-	-	-	-	3	-	1	2	-	-	-

Unit – I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Unit – II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

Unit – III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Unit – IV

Local Administration: District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation

PanchayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Unit – V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission;, Functions of Commissions for the welfare of SC/ST/OBC and women

Text Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.

Reference Books:

1. J.A. Siwach, Dynamics of Indian Government & Politics.
2. D.C. Gupta, Indian Government and Politics.
3. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
4. J.C. Johari, Indian Government and Politics Hans.

Web Links:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

ADVANCED DATA STRUCTURES
Common to CSE&IT

IIISemester
Course Code:201CS3T01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make use of external sorting and hashing for sorting and searching.
- CO2:** Illustrate the operations of Priority Queues.
- CO3:** Analyze the operations of efficient Binary Search Trees and multiway search trees.
- CO4:** Compare different operations of digital search structures.
- CO5:** Apply the string processing algorithms for pattern matching.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	1
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	1

Unit - I

External Sorting: Introduction, K-way Merge Sort, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs, Huffman Tree.

Hashing: Introduction to Static Hashing, Hash Tables, Hash Functions, Different Hash Functions, Collision Resolution Techniques, Dynamic Hashing.

Unit – II

Priority Queues (Heaps): Introduction, Binary Heaps-Model and Simple Implementation, Basic Heap Operations, Other Heap Operations, Applications of Priority Queues, Binomial Heaps (or Queues), Binomial Heap Structure and Implementation, Binomial Queue Operations.

Unit – III

Efficient Binary Search Trees: Self-balancing Binary Search Tree, AVL Trees, Rotations-LL, RR, LR and RL, Searching, Insertion, Deletion operations on AVL Trees, Red-Black Tree, Properties and Representation of Red-Black Trees, Insertion and deletion operations on Red-Black Trees, Applications of Red-Black Trees

Unit – IV

Multiway Search Trees: M-Way Search Trees Definition and Properties, B-Tree Definition and Properties, Searching, Insertion and Deletion operations on B-Trees, B+ Tree, Insertion and Deletion operations on B+ Trees.

Digital Search Structures: Introduction to Digital Search Tree, Operations on Digital Search Trees- Insertion, Searching, and Deletion.

Unit – V

Digital Search Structures: Binary Tries, Compressed Binary Trie, Patricia, Searching Patricia, inserting into Patricia, delete a node from Patricia, Multiway Tries- Definition, Searching a Trie, Compressed Tries, Compressed Tries with Digit Numbers-Searching, Insertion, Deletion.

String Processing: String Operations, Brute-Force Pattern Matching, The BoyerMoore Algorithm, The Knuth-Morris-Pratt Algorithm, The Longest Common Subsequence Problem (LCS).

Text Books:

1. Advanced Data Structures, ReemaThareja, S. Rama Sree, Oxford University Press.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, Pearson.

Reference Books:

1. Fundamentals Of Data Structures In C, Horowitz, Sahni, Anderson-Freed, Second edition
2. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, and J. D. Ullman, Pearson.
3. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, Third Edition, The MIT Press.
4. Advanced Data Structures, Peter Brass, Cambridge University Press.

Web Links:

1. https://ocw.mit.edu/courses/...and...data-structures...notes/MIT6_851S12_L1.
2. <http://nptel.ac.in/courses/106103069/26>
3. <https://csd.cs.cmu.edu/course-profiles/15-121-Introduction-to-Data-Structures>
4. <https://www.cs.purdue.edu/cgvlab/courses/251/lectures/slides/04.03-Pattern%20atching%20AndTries.pdf>
5. <https://www.csie.ntu.edu.tw/~ds/ppt/ch5/chapter5.PPT>

OBJECT ORIENTED PROGRAMMING THROUGH C++
Common to CSE&IT

III Semester
Course Code: 201CS3T02

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Compare object oriented programming with procedure oriented programming.
- CO2:** Summarize OOPS concepts.
- CO3:** Develop applications using constructor and destructor.
- CO4:** Apply C++ features for problem solving.
- CO5:** Apply inheritance concepts to solve a given problem.
- CO6:** Design C++ classes using templates and STL.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	1	2	1	-	-	-	-	-	-	-	-	-
CO4	1	1	2	-	-	-	-	-	-	-	-	-
CO5	1	1	2	-	-	-	-	-	-	-	-	-
CO6	2	1	2	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit - I

Introduction to C++: Differences between C and C++, Evolution of C++, the Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantages of OOP, Namespace

Unit – II

Classes and Objects: Declaring Objects- Access Specifiers and their Scope, Defining Member Function, Rules for Inline Functions, static Member Variable, static Member Function, Friend functions, overloading Member Function, Nestedclass.

Constructors and Destructor Classes in C++: Constructors and Destructors, Introduction to Constructors and Destructor- Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments, Copy Constructor, Destructors, Anonymous Objects.

Unit – III

Operator Overloading: Introduction, The Keyword Operator- Overloading Unary Operator, Operator Return Type, Overloading Binary Operator, Overloading using friend function, Overloading Assignment Operator (=), Rules for Overloading Operators.

Inheritance: Introduction, Reusability, Types of Inheritance, Virtual Base Classes, Object as a Class MeMber, Abstract Classes, Advatages and Disadvantages of Inheritance.

Pointers: Pointer to Class- Pointer Object, this Pointer, Pointer to Derived Classes and Base Class.

Binding Polymorphisms and Virtual Functions: Introduction, Binding in C++,Virtual Functions, Rules for Virtual Function, Abstract classes, Virtual Destructor

Unit – IV

Generic Programming with Templates: Introduction, Need for Templates,Definition of class Templates, Normal Function Templates, Overloading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked list with templates.

Unit – V

Exception Handling: Introduction, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library: Introduction, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps

Text Books:

1. The Complete Reference C++, Herbert Schildt, Fourth Edition, TMH
2. The C++ Programming Language, Bjarne Stroustrup, Fourth Edition, Pearson.

Reference Books:

1. A First Book Of C++, Gary Bronson, Fourth Edition, Cengage Learning.
2. C++ Primer Plus By Stephen Prata, Sixth Edition, Pearson.
3. C++ Programming:From Problem Analysis To Program Design, Ds Malik,Eighth Edition, Cengage Learning.

Web Links:

1. <http://nptel.ac.in/courses/106105151/>
2. <http://www.geeksforgeeks.org/c-plus-plus/>
3. <https://www.javatpoint.com/cpp-oops-concepts>
4. https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.html

OPERATING SYSTEMS

Common to CSE&IT

IIISemester
Course Code:201CS3T03

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Describe basic concepts of operating system.
- CO2:** Analyse the performance of process scheduling algorithms
- CO3:** Demonstrate process synchronization and deadlock handling.
- CO4:** Analyse the performance of Memory-Management Strategies.
- CO5:** Analyse the performance of disk scheduling algorithms.
- CO6:** Illustrate file system implementation, Protection and security.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	1	2	1	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	1	1	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	1	-
CO4	2	-
CO5	2	-
CO6	1	-

Unit - I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, System Boot.

Unit – II

Process Concept: Process scheduling, Operations on processes, Inter-process communication.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Unit – III

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

Unit – IV

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

File Systems: Files, Directories, File system implementation, management and optimization.

Unit – V

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats.

Case Studies: Linux, Microsoft Windows.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B Galvin and Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2013.
2. Modern Operating Systems, Tanenbaum A S, 3rd edition, Pearson Education, 2008.

Reference Books:

1. Operating Systems A Concept Based Approach, Dhamdhere D M, 3rd edition, Tata McGraw-Hill, 2012.
2. Operating Systems -Internals and Design Principles, Stallings W, 6th edition, Pearson Education, 2009.
3. Operating Systems, Nutt G, 3rd edition, Pearson Education, 2004.

Web Links:

1. <http://nptel.ac.in/downloads/106108101/>
2. <https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems>
3. <http://www.geeksforgeeks.org/operating-systems/>
4. <https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923>

SOFTWARE ENGINEERING

Common to CSE&IT

IIISemester
Course Code:201CS3T04

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Demonstrate the fundamental concepts of software engineering
- CO2:** Compare Process development models for efficient software development.
- CO3:** Describe the activities of Software Project Management for any application
- CO4:** Create the software process artifacts (SRS document, Design diagrams, test cases) for any application.
- CO5:** Analyze quality and reliability of software.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	2	2	2	1
CO3	2	1	1	-	-	-	-	-	-	-	2	1
CO4	3	2	2	1	-	-	-	-	2	2	2	1
CO5	1	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	3	3
CO4	2	2
CO5	2	2

Unit - I

Introduction to Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths.

Software Process: Software Process, Process Classification, Phased Development LifeCycle, Software Development Process Models – Waterfall Model, Iterative Waterfall Model, Prototype Model, Incremental Model, Spiral Model, Agile Process Model and RUP process Model.

Case Study: Survey on different process models including.

- i. Advantages and Disadvantages of the models.
- ii. Applicability of the model.
- iii. Projects developed using various models.

Unit – II

Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management.

Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques.

Case Study: Estimate the effort of the software development using Functional Points and COCOMO Model for any real time problem.

Unit – III

Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management. **Case Study:** Create a SRS document for any one of the following Software Projects.

1. Course Registration System
2. Students Marks Analyzing System
3. Online Ticket Reservation System
4. Stock Maintenance

Unit – IV

Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies,

Implementation: Coding Principles, Coding Process, Code Verification, and Code Documentation.

Case Study: Construct the DFD and CFD for any one of the following Software Projects.

1. Airline Reservation System
2. Students Marks Analyzing System
3. ATM System
4. Library Management System

Unit – V

Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, White Box Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches.

Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, and Software Reliability.

Case Study: Design the test cases for any one of the following real time scenarios using White Box & Black Box Testing Techniques.

1. E-Commerce application (Flipkart, Amazon)
2. Mobile Application

Text Books:

1. Software Engineering – Concepts and Practices: Ugrasen Suman, Cengage Learning.
2. Software Engineering: A practitioner's approach, Roger S. Pressman, McGrawHill.

Reference Books:

1. Software Engineering, Ian Sommerville, Ninth Edition, Pearson
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India
3. Fundamentals of Software Engineering, Rajib Mall, Prentice Hall India.
4. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill.
5. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

Web Links:

1. https://www.tutorialspoint.com/software_engineering/
2. <http://nptel.ac.in/courses/106/105/106105182/>
3. <https://www.coursera.org/learn/software-processes-and-agile-practices>
4. <http://www.geeksforgeeks.org/software-engineering-gq/>
5. <https://www.coursera.org/browse/computer-science/software-development>

DISCRETE MATHEMATICS
(Common to CSE , IT, AIML & CSE(DS))

III Semester Course Code: 201BS3T13	L 3	T 0	P 0	C 3
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Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply the principles of mathematical logic to statements calculus and predicate calculus.
- CO2:** Compute Transitive closure, equivalence classes of binary relations.
- CO3:** Solve recurrence relations by various methods.
- CO4:** Apply the concepts of graph theory to find Euler paths, Hamiltonian paths.
- CO5:** Apply the concepts of graph theory to trees.
- CO6:** Construct Partial ordering relations using Hasse diagram`

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Unit - I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus. Predicate Calculus: Predicate Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

Unit – II

Binary Relations and Properties: Binary relations, Properties, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive, Closure, Warshall Algorithm, Equivalence relation, R-Equivalence class, Partial Ordering Relation, Partially ordered sets, Hasse Diagrams.

Unit – III

Recurrence Relations: Recurrence Relations, Formation of Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots.

Unit – IV

Graph Theory: Basic Concepts of Graphs, Matrix Representation of Graphs: Adjacency Matrix, Incidence Matrix, Isomorphic Graphs, Paths and Circuits, Euler and Hamilton Graphs, Planar Graphs and Euler's Formula.

Unit – V

Trees: Trees-Properties, Spanning trees, BFS Algorithm, DFS Algorithm, Minimal Spanning Trees and Kruskal's Algorithm, Graph Colouring, Chromatic Number.

Text Books:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, Kenneth H. Rosen
2. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and R. Manohar, Tata Mc Graw Hill.
3. Mathematical Foundations of Computer Science, S. Santha, E. V. Prasad, Cengage Publishers.

Reference Books:

1. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby, Sharon Cutler Ross, PHI.
2. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel, T.P.

Baker, 2nd Edition, Prentice Hall of India.

3. Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.

Web Links:

1. https://en.wikipedia.org/wiki/Discrete_mathematics
2. <http://nptel.ac.in/courses/106106094/>
3. <http://mathworld.wolfram.com/classroom/classes/DiscreteMathematics.html>
4. <http://mathworld.wolfram.com/topics/GeneralLogic.html>

OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB
Common to CSE&IT

III Semester
Course Code:201CS3L01

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Use programming constructs in solving problems.
- CO2:** Apply object oriented techniques to solve problems.
- CO3:** Build applications using inheritance.
- CO4:** Apply exception handling technique to handle various errors.
- CO5:** Develop programs using Inline, friend functions, reference variable, this pointer, operator Overloading, static and dynamic binding, template and STL
- CO6:** Develop applications using QT creator.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	1	2	-	1
CO2	2	2	2	1	-	-	-	-	1	2	-	1
CO3	2	2	3	1	-	-	-	-	1	2	-	1
CO4	2	2	3	1	-	-	-	-	1	2	-	1
CO5	2	2	3	1	-	-	-	-	1	2	-	1
CO6	2	2	3	1	2	-	-	-	1	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week – 1

1. CONTROL FLOW: 1.1) Develop a C++ program to find the roots of a quadratic equation. 1.2) Develop a C++ program to find factorial of a given number using recursion

Week – 2

2. VARIABLE AND SCOPE: 2.1) Develop a C++ program to illustrate scope resolution and namespaces. 2.2) Develop a C++ program illustrating Inline Functions.

Week – 3

3. CLASS AND OBJECT: 3.1) Develop a C++ program demonstrating a Bank Account with necessary data members and member functions. 3.2) Develop a C++ program for illustrating Access Specifiers :public and private. 3.3) Develop a C++ program to illustrate this pointer.

Week – 4

4. FUNCTIONS: 4.1) Develop a C++ program illustrate function overloading. 4.2) Develop a C++ program

to illustrate the use of default arguments. 4.3) Develop a C++ program illustrating friend function.

Week – 5

5. CONSTRUCTOR AND DESTRUCTOR: 5.1) Develop a C++ Program to illustrate the use of Constructors and Destructors. 5.2) Develop a C++ program illustrating Constructor overloading. 5.3) Develop a C++ program illustrating Copy Constructor.

Week – 6

6. OPERATOR OVERLOADING: 6.1) Develop a C++ program to Overload Unary, and Binary Operators using member function. 6.2) Develop a C++ program to Overload Unary, and Binary Operators using friend function. 6.3) Develop a case study on Overloading Operators and Overloading Functions. (150 Words).

Week – 7

7. INHERITANCE: 7.1) Develop C++ Programs to incorporate various forms of Inheritance i. Single Inheritance ii. Multiple Inheritances iii. Multi-level inheritance iv. Hierarchical Inheritance v. Hybrid inheritance 7.2) Develop a C++ program in C++ to illustrate the order of execution of constructors and destructors in inheritance.

Week – 8

8. POINTERS: 8.1) Develop a C++ program to illustrate object as a class member. 8.2) Develop a C++ program to illustrate pointer to a class. 8.3) Develop a C++ program to illustrate Virtual Base Class.

Week – 9

9. POLYMORPHISM: 9.1) Develop a C++ program to illustrate virtual functions. 9.2) Develop a C++ program to illustrate runtime polymorphism. 9.3) Develop a C++ program to illustrate pure virtual function and calculate the area of different shapes by using abstract class.

Week – 10

10. TEMPLATES: 10.1) Develop a C++ Program illustrating function template. 10.2) Develop a C++ Program illustrating template class. 10.3) Develop a C++ program to illustrate class templates with multiple parameters.

Week – 11

11. EXCEPTIONS: 11.1) Develop a C++ program for handling Exceptions. 11.2) Develop a C++ program to illustrate the use of multiple catch statements.

Week – 12

12. STL: 12.1) Develop a C++ program to implement List, Vector and its Operations. 12.2) Develop a C++ program to implement Deque and Deque Operations. 12.3) Develop a C++ program to implement Map and Map Operations.

List of Augmented Experiments:

13. Develop a C++ program for flight booking system
14. Develop Qt application containing slider and spin box in which a slider responds to changes in the spin box.
15. Develop a Qt application for creating a text pad.
16. Develop a C++ program with maximum of 20 characters, that your user will be guessed and will show only asterisks (*) on the screen. The user will input or enter one character at a time. And for every correct character, the asterisk will be replaced by that character until all the characters or the mystery word/s will reveal. Your program will accept a maximum three (3) errors or mistakes in entering/inputting character otherwise the mystery word/s will be viewed. Sample Output: Output: ***** Enter your character: e Output: ***e**e Enter your character: a Output: sorry! the character is not existing. you still have 2 chances Enter your character: s Output: s**e**e Enter your character: c Output: sc*e*ce Enter your character: i Output: scie*ce Enter your character: n Output: science

Reference Books:

1. C++ Primer Plus by Stephen Prata, Sixth Edition, Pearson.
2. C++ GUI Programming with Qt4, Jasmin Blanchette, Mark Summerfield, Second Edition, Prentice Hall Press.
3. C++ for Programmers, Paul J. Deitel, Harvey M. Deitel, Pearson.

Web Links:

1. <http://en.cppreference.com/w/cpp/links/libs>
2. <https://www.daniweb.com/digital-media/ui-ux-design/threads/113591/trying-to-run-a-program-through-a-web-link>
3. <http://www.yolinux.com/TUTORIALS/LinuxTutorialC++.html>
4. <https://github.com/fffaraz/awesome-cpp>
5. http://www.techsystemsembedded.com/cpp_links.ph

OPERATING SYSTEMS LAB
Common to CSE&IT

III Semester
Course Code: 201CS3L02

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate various process scheduling algorithms.
- CO2:** Experiment with various system calls and deadlock algorithm.
- CO3:** Develop algorithms for memory management.
- CO4:** Explain Page replacement algorithms and file allocation strategies.
- CO5:** Make use of Pthread library for thread concurrent execution.
- CO6:** Develop algorithm for memory allocation techniques.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	1	-	-	-	-	-	-	-
CO2	2	1	-	1	2	-	-	-	-	-	-	-
CO3	2	1	1	-	1	-	-	-	-	-	-	-
CO4	2	2	-	-	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	-
CO6	2	1	-	1	2	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
CO6	2	-

List of Experiments:

Week – 1

Simulate the following CPU scheduling algorithms:(a) FCFS (b) SJF

Week – 2

Simulate the following CPU scheduling algorithms:(a) Priority (b) Round Robin

Week – 3

Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

Week – 4

Simulate the Multiprogramming with a fixed number of tasks (MFT)

Week – 5

Simulate the Multiprogramming with a variable number of tasks (MVT)

Week – 6

Simulate Bankers Algorithm for Dead Lock Avoidance

Week – 7

Simulate the FIFO page replacement algorithm

Week – 8

Simulate the LRU page replacement algorithm

Week – 9

Simulate the following File allocation strategies (a) Sequenced (b) Indexed (c) Linked

Week – 10

Write a C program that illustrates two processes communicating using shared memory

Week – 11

Write C program to create a thread using pthreads library and let it run its function.

Week – 12

Write a C program to illustrate concurrent execution of threads using pthreads library

List of Augmented Experiments:

13. Simulate Bankers Algorithm for Dead Lock Prevention
14. Simulate Best-Fit contiguous memory allocation technique
15. Simulate FCFS Disk Scheduling algorithm
16. Write a C program to simulate producer and consumer problem using semaphores

Reference Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B Galvin and Greg Gagne,9th Edition, John Wiley and Sons Inc., 2013.
2. Modern Operating Systems, Tanenbaum A S, 3rd edition, Pearson Education, 2008.
3. Operating Systems: A Modern Perspective, Gary J. Nutt.

Web Links:

1. <http://nptel.ac.in/downloads/106108101/>
2. <https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems>
3. <http://www.geeksforgeeks.org/operating-systems/>
4. <https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923>

UNIX AND SHELL PROGRAMMINGLAB

III Semester **L** **T** **P** **C**
Course Code:201CS3L03 0 0 3 1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate the basic UNIX file system and Environment Variables
- CO2:** Make use of Vi editor to write shell script and C Programs
- CO3:** Apply UNIX commands to control various resources file, network, disk etc.
- CO4:** Develop Shell Script using Shell commands
- CO5:** Apply system calls for file operations and Process Management .

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	1	2	-	-
CO2	2	-	-	-	1	-	-	-	1	2	-	-
CO3	2	1	-	-	1	-	-	-	1	2	-	-
CO4	2	1	-	-	1	-	-	-	1	2	-	-
CO5	2	2	1	1	1	-	-	-	1	2	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-

List of Experiments:

Week – 1

- a) Study of Unix/Linux general purpose utility command list: man, who, cat, cd,cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod,chown, finger, pwd, cal, logout, shutdown.
- b) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
- c) Study of Unix/Linux file system (tree structure).
- d) Study of .bashrc, /etc/bashrc and Environment variables

Week – 2

Use the cat command to create a file containing the following data.Call itmytable use tabs to separate the fields.

1425 Ravi 15.65

4320 Ramu 26.27

6830 Sita 36.15 1450 Raju 21.86 1450 Raju 21.86 b) Study of vi editor

c) Use the cat command to display the file, my table.

d) Use the vi command to correct any errors in the file, my table.

e) Use the sort command to sort the file my table according to the first field.

Call the sorted file my table (same name).

f) Print the file my table.

Week – 3

- a) Write a C program that makes a copy of a file using standard I/O, and systemcalls.
- b) Write a C program to emulate the UNIX ls -l command.
- c) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort.

Week – 4

- a) Write a shell script that takes a command –line argument and reports onwhether it is directory, a file or something else.
- b) Write a shell script that accepts one or more file name as arguments andconverts all of them to uppercase provided they exist in the current directory.

Week – 5

- a) Write a shell script that determines the period for which a specified user isworking on the system.
- b) Write a shell script that accepts a file name starting and ending line numbersas arguments and displays all the lines between the given line numbers.

Week – 6**Shell Script**

Write a shell script that computes the gross salary of a employee according to thefollowing rules:

- i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of thebasic.
- ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic. Thebasic salary is entered interactively through the key board.

Week – 7**Shell Script**

- a) Write a shell script that accepts two integers as its arguments and computesthe value of first number raised to the power of the second number.
- b) Write a shell script which will display Armstrong number from givenarguments.

Week – 8**Shell Script**

Write an interactive file-handling shell program. Let it offer the user thechoice of copying, removing, renaming, or linking files. Once the user hasmade a choice, have the program ask the user for the necessary information,such as the file name, new name and so on

Week – 9

- a) Write shell script that takes a login name as command – line argument andreports when that person logs in.
- b) Write a shell script which receives two file names as arguments. It shouldcheck whether the two file contents are same or not. If they are same thensecond file should be deleted.

Week – 10

Write a C program that takes one or more file or directory names as acommand line input and reports the following information on the file:

- i) File type.
- ii) Number of links.
- iii) Read, write and execute permissions.
- iv) Time of last access (Note : Use stat/fstat system calls)

Week – 11

Write a C program which supports that child process inherits environmentvariables, command line arguments, opened' files.

Week – 12

Write a shell script to display factorial value from given argument list.

List of Augmented Experiments:

13. Write a shell script to display reverse number from given argument list
14. Write a shell script which will display Fibonacci series up to a given number of arguments.
15. Write a shell script to change the ownership of processes.

16. Write a shell script to accept student number, name, marks in 5 subjects. Find total, average and grade.

Display the result of the student and store in a file called stu.dat

Rules: AVG \geq 80 the grade A

AVG $<$ 80 && AVG \geq 70 then grade B

AVG $<$ 70 && AVG \geq 60 then grade C

AVG $<$ 60 && AVG \geq 50 then grade D

AVG $<$ 50 && AVG \geq 40 then grade E

Else grade F

Reference Books:

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson.
2. Unix Shell Programming, M.G.Venkateshmurthy, Pearson.
3. Your Unix the ultimate guide, Sumitabha Das, 2nd Edition, TMH
4. The Unix programming Environment, Brian W. Kernighan & Rob Pike, Pearson.
5. Advanced Programming in UNIX Environment, W.Richard Stevens, Stephen, Rago, 3rd Edition.

Web Links:

1. www.iu.hio.no/~mark/unix/unix.html
2. <http://www.tutorialspoint.com/unix/>
3. www.learnshell.com
4. <https://www.informationvine.com>

APPLICATIONS OF PYTHON -NUMPY
Common to CSE&IT
Skill Oriented Course- I

III Semester
Course Code: 201CS3P01

L	T	P	C
0	0	4	2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain how data is collected, managed and stored for processing
- CO2:** Analyze the working of various numerical techniques, different descriptive measures of Statistics to solve engineering problems.
- CO3:** Apply some linear algebra operations to n-dimensional arrays.
- CO4:** Develop data wrangling tasks using NumPy in Python.
- CO5:** Develop data computational tasks in Python.
- CO6:** Make use correlation and regression techniques to provide optimal solution for complex problems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	-	2	2	-	-	-	1	1	-	1
CO2	1	2	-	2	3	-	-	-	2	2	-	2
CO3	1	2	2	3	2	-	-	-	2	2	-	2
CO4	1	2	2	2	3	-	-	-	2	2	-	2
CO5	1	2	2	3	2	-	-	-	2	2	-	2
CO6	1	2	2	3	2	-	-	-	2	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

List of Experiments:

Week – 1

NumPy Array - I

1. Write a NumPy program using methods – info, add, array, all, greater, greater_equal, less and less_equal, equal, allclose, zeros, ones, linspace, tolist
 - a. To get help on the add function
 - b. To test whether none of the elements of a given array is zero.
 - c. To create an element-wise comparison (greater, greater_equal, less and less_equal, equal, equal within a tolerance) of two given arrays.
 - d. To create one-dimensional array of 10 zeros, 10 ones, 10 fives, single, two and three digit numbers.
 - e. To create a vector of length 10 with values evenly distributed between 5 and 50.
 - f. To convert a given list into an array, then again convert it into a list. Check initial list and final list are equal or not.

Week – 2

NumPy Array - II

2. Write a NumPy program using NumPy methods - max, min, argmax, argmin, argmax, repr, count, bincount, unique

- a. To extract all numbers from a given array which are less and greater than a specified number.
- b. To find the indices of the maximum and minimum numbers along the given axis of an array.
- c. To find the values of the maximum and minimum numbers along the given axis of an array.
- d. To find the number of occurrences of a sequence in a NumPy array
- e. To find the most frequent value in a NumPy array
- f. To count the frequency of unique values in NumPy array.

Week – 3

NumPy Array - III

3. Write a NumPy program using methods - asarray, append, size, itemsize, nbytes, unique, union1d, tile

- a. To convert a list and tuple into arrays.
- b. To append values to the end of an array.
- c. To find the number of elements of an array, length of one array element in bytes and total bytes consumed by the elements
- d. To get the unique elements of an array.
- e. To find the union of two arrays. Union will return the unique, sorted array of values that are in either of the two input arrays
- f. To construct an array by repeating its elements.

Week – 4

NumPy Array - IV

4. Write a NumPy program using methods – arange, dot, savetxt, loadtxt, sin, sort

- a. To create an array of all the even integers from 30 to 70.
- b. To create a vector with values ranging from 15 to 55 and print all values except the first and last.
- c. To compute the inner product of two given vectors.
- d. To save a given array to a text file and load it.
- e. To compute the x and y coordinates for points on a sine curve and plot the points using matplotlib.
- f. To sort a given array by row and column in ascending order.

Week – 5

NumPy Matrix - I

5. Write a NumPy program using NumPy Matrix – shape, reshape, identity or eye, ones, zeros, nditer, diag, sum

- a. To find the number of rows and columns of a given matrix using NumPy
- b. To display the shape of array and create a new shape to an array without changing its data.
- c. To create a 3x3 identity matrix using identity and eye. State the difference.
- d. To create a 10x10 matrix, in which the elements on the borders will be equal to 1, and inside 0.
- e. To create a 5x5 zero matrix with elements on the main diagonal equal to 1, 2, 3, 4, 5.
- f. To compute sum of all elements, sum of each column and sum of each row of a given array.

Week – 6

NumPy Matrix - II

6. Using NumPy Matrix – arange, trace/diagonal, add, subtract, dot,

- a. To create a 4x4 array, now create a new array from the said array swapping first and last, second and third columns.
- b. To swap rows and columns of a given array in reverse order.
- c. To find the sum of diagonal elements (trace) of matrix
- d. To add Matrices
- e. To subtract Matrices
- f. To multiply Matrices

Week – 7

NumPy Random

7. Write a NumPy program using NumPy Random - random.normal, random.randint, random.random, random.shuffle, random.permutation

- a. To generate an array of 15 random numbers from a standard normal distribution.
- b. To create a vector of length 5 filled with arbitrary integers from 0 to 10.
- c. To multiply the values of two given vectors.
- d. To create a 3x3x3 array filled with arbitrary values.
- e. To create a random vector of size 10 and sort it.
- f. To shuffle numbers between 0 and 10 (inclusive).

Week – 8

NumPy Linear Algebra

8. Write a NumPy program using Linear Algebra – inner, outer, cross, linalg.det, linalg.norm, inv, linalg.eig

- a. To compute the inner, outer, cross product of two given vectors
- b. To compute the determinant of a given square array.
- c. To find a matrix or vector norm.
- d. To compute the inverse of a given matrix.
- e. To compute Euclidean distance between 2 arrays. (Use linalg.norm or dot or sum, square, sqrt)
- f. To compute the eigenvalues and right eigenvectors of a given square array.

Week – 9

NumPy Searching and Sorting

9. Write a NumPy program using Searching or Sorting – sort, lexsort, argsort, sort_complex, partition

- a. To create a structured array from given student name, height, class and their data types. Now sort the array on height.
- b. To create a structured array from given student name, height, class and their data types. Now sort by class, then height if class are equal.
- c. To sort the student id with increasing height of the students from given students id and height. Print the integer indices that describes the sort order by multiple columns and the sorted data.
- d. To get the indices of the sorted elements of a given array.
- e. To sort a given complex array using the real part first, then the imaginary part.
- f. To partition a given array in a specified position and move all the smaller elements values to the left of the partition, and the remaining values to the right, in arbitrary order.

Week – 10

NumPy Mathematics

10. Write a NumPy program using Mathematics – logaddexp, logaddexp2, absolute, power, round, rint, floor, ceil, trunc

- a. To compute logarithm of the sum of exponentiations of the inputs, sum of exponentiations of the inputs in base-2.
- b. To calculate the element-wise absolute value of array.
- c. To get the powers of an array values element-wise.
- d. To round array elements to the given number of decimals, round elements of the array to the nearest integer.
- e. To get floor, ceiling and truncated values of the elements of an array
- f. To determine the positive square-root of an array

Week – 11

NumPy Statistics

11. Write a NumPy program using Statistics – amax, amin, mean, median, average, histogram.

- a. To get the minimum and maximum value of a given array along the second axis.
- b. To compute the median of flattened given array.
- c. To compute the weighted average of a given array.
- d. To compute the mean, standard deviation, and variance of a given array along the second axis.
- e. To compute the histogram of nums against the bins.

- f. To plot line graph from NumPy array

Week – 12

NumPy String

12. Write a NumPy program using Strings – capitalize, lower, upper, swapcase, title, strip, replace, count, find, vectorize, split

- a. To capitalize the first letter, lowercase, uppercase, swapcase, title-case of all the elements of a given array
- b. To remove the leading and trailing whitespaces of all the elements of a given array
- c. To replace "PHP" with "Python" in the element of a given array.
- d. To count the number of "P" and lowest index of "P" in a given array, element-wise.
- e. To find the length of each string element in the Numpy array.
- f. To split a given text into lines and split the single line into array values.

List of Augmented Experiments:

- 13. a. To convert a NumPy array into a csv file
b. To convert an image to NumPy array and save it to CSV file using Python?
- 14. a. To add one polynomial to another using NumPy in Python?
b. To subtract one polynomial to another using NumPy in Python?
c. To multiply a polynomial to another using NumPy in Python?
d. To divide a polynomial to another using NumPy in Python?
- 15. a. To find the roots of the polynomials using NumPy
b. To evaluate a 2-D polynomial series on the Cartesian product
c. To evaluate a 3-D polynomial series on the Cartesian product
d. Calculate the QR decomposition of a given matrix using NumPy

Text Books:

- 1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes Mc Kinney, O'Reilly Media.

Reference Books:

- 1. Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib, Robert Johansson.

Web Links:

- 1. <https://numpy.org/>
- 2. <https://www.geeksforgeeks.org/numpy-linear-algebra/>
- 3. <https://www.w3schools.com/python/numpy/default.asp>

WEB APPLICATION DEVELOPMENT USING FULL STACK FRONTEND DEVELOPMENT – MODULE –I

Skill Oriented Course- I

III Semester

L T P C

Course Code: 201CS3P02

0 0 4 2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make use of HTML tags, elements and their attributes for designing static web pages.
 - CO2:** Experiment with tables to align data and hyperlinks for interactive web pages.
 - CO3:** Apply form elements for developing Registration and Login webpages.
 - CO4:** Build a web page by applying appropriate CSS styles to HTML elements.
 - CO5:** Develop any web site using the core concepts of HTML5 and CSS3.
 - CO6:** Make use of media elements to include audio and video files in a website.

Mapping of course outcomes with program outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	-	-	2	2	-	1
CO2	1	2	3	-	2	-	-	-	2	2	-	1
CO3	1	2	2	-	2	-	-	-	2	2	-	1
CO4	1	3	3	-	2	-	-	-	2	2	-	1
CO5	1	1	3	3	2	-	-	-	2	2	-	1
CO6	1	2	3	-	2	-	-	-	2	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Perform experiments related to the following concepts:

HTML:

Introduction to HTML, Browsers and HTML, Editor's Offline and Online, Tags, Attribute and Elements, DOCTYPE Element, Comments, Headings, Paragraphs, and Formatting Text, Lists and Links, Images and Tables, Forms

CSS:

Introduction CSS, Applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties, CSS General Topics.

List of Experiments:

- Experiment 1:** **Introduction to HTML, Browsers and HTML, Editor's Offline and Online, Tags, Attribute and Elements, DOCTYPE Element**
- Explain the procedure to create a HTML program using different editors.
 - Explain the procedure to run a HTML program using Browser.
 - List some of the offline and online editors to create and run HTML pages.
 - Explain with syntax, the use of DOCTYPE in HTML page.
 - Write a HTML program to experience the HTML Page Structure.
- Experiment 2:** **Comments, Headings, Paragraphs.Formatting Text**
- Write a HTML program, that makes use of basic tags like `<html>`, `<head>`, `<title>`, `<body>`, `<p>`, `<hr>`, `
`, `<h1>` to `<h6>`, `<!-- -->` tags and their attributes.
 - Write a HTML program, that makes use of text formatting tags like ``, `<i>`, `<u>`, ``, `<sub>`, `<super>`, `<tt>`, `<pre>`.
 - Write a HTML program, to explain the working of `` tag and its attributes.
- Experiment 3:** **Lists and Links**
- Write a HTML program, to explain the working of lists.
Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
 - Write a HTML program, to explain the working of hyperlinks using `<a>` tag and href, target Attributes.
Note: Use text to link →<https://www.aec.edu.in/>
Use image to link →<https://www.aec.edu.in/?p=Gallery>
- Experiment 4:** **HTML Images**
- Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
 - Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to a full sized version of the image. Create an image gallery using this technique.
- Experiment 5:** **HTML Tables**
- Write a HTML program, to explain the working of tables. (use tags : `<table>`, `<tr>`, `<th>`, `<td>` and attributes : border, rowspan, colspan)
 - Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use `<caption>` tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
- Experiment 6:** **Frames and Forms**
- Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame → image, second frame → paragraph, third frame → hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).
 - Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using `<select>` & `<option>` tags, `<text area>` and two buttons ie: submit and reset).

Use tables to provide a better view).

Experiment 7: **HTML 5**

- Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, <div>, tags.
- Write a HTML program, to embed audio and video into HTML web page.

Experiment 8: **Cascading Style Sheets, types of CSS, Selector forms**

Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

Experiment 9: Write a program to apply different types of selector forms

- Simple selector (element, id, class, group, universal)
- Combinator selector (descendant, child, adjacent sibling, general sibling)
- Pseudo-class selector
- Pseudo-element selector
- Attribute selector

Experiment 10: **Color, Background and CSS Box Model**

- Write a program to demonstrate the various ways you can reference a color in CSS.
- Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.

Experiment 11: a. Write a program, to explain the importance of CSS Box model usimg

- Content
- Border
- Margin
- padding

- b. Write a program using the following terms related to CSS font and text:
- font-size
 - font-weight
 - font-style
 - text-decoration
 - text-transformation
 - text-alignment

Experiment 12: a. Write a CSS program, to apply 2D transformations in a web page.

- b. Write a CSS program, to apply 3D transformations in a web page.
c. Write a CSS program, to apply Animations in a web page.

Experiment 13-16: **List of Augmented Experiments: (Any 2 must be completed)**

- Design a web page with all the features of HTML elements.
- Design a web page with new features of HTML5.
- Design a web page with all the features of HTML elements and apply CSS styles.
- Design a web page with new features of HTML5 and CSS3.

Text Books:

- Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
- Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
- An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.

Web Links:

- <https://www.w3schools.com/html>
- <https://www.w3schools.com/css>

BIOLOGY FOR ENGINEERS

Common to all branches

IIISemester
Course Code:201MC3T03

L	T	P	C
2	0	0	0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1: Apply biological engineering principles, procedures needed to solve real-world problems.
- CO2: Demonstrate the fundamentals of living things, their classification, cell structure and biochemical constituents.
- CO3: Apply the concept of plant, animal and microbial systems and growth in real life Situations.
- CO4: Explain genetics and the immune system to know the cause, symptoms, diagnosis and treatment of common diseases.
- CO5: Demonstrate basic knowledge of the applications of biological systems in relevant industries.
- CO6: Apply the basic knowledge of transgenic plants and animals for the benefit of society.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	2	1	2	-	-	3
CO2	-	-	-	-	-	-	1	3	1	-	-	2
CO3	-	-	-	-	-	-	2	1	2	-	-	3
CO4	-	-	-	-	-	-	1	3	1	-	-	2
CO5	-	-	-	-	-	-	1	3	1	-	-	2
CO6	-	-	-	-	-	-	3	1	2	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to life:

Characteristics of living organisms-Basic classification-cell theory-structure of prokaryotic and eukaryotic cell-Introduction to biomolecules: definition-general classification and important functions of carbohydrates-lipids-proteins-nucleic acids vitamins and enzymes-genes and chromosome.

Unit – II

Biodiversity Plant System: basic concepts of plant growth-nutrition-photosynthesis and nitrogen fixation-

Animal System: elementary study of digestive-respiratory-circulatory-excretory systems and their functions

Microbial System: history-types of microbes-economic importance and control of microbes.

Unit – III

Genetics and immune system: Evolution: theories of evolution-Mendel's cell division-mitosis and meiosis-evidence of laws of inheritance-variation and speciation- nucleic acids as a genetic material-central dogma immunity antigens-antibody-immune response

Unit – IV

Human diseases: Definition- causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis.

Unit – V

Biology and its industrial applications: Transgenic plants and animal , stem cell and tissue engineering, bio-reactors, bio-pharming, recombinant vaccines, cloning-drug discovery, biological neural networks, bio-remediation, bio-fertilizer, bio-control, bio-filters, bio-sensors, bio-polymers, bio-energy, bio-materials, bio-chips, basic biomedical instrumentation

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013.
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004.

Reference Books:

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011.
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008.
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

Web Links:

1. <https://www.biology-online.org/>
2. <http://www.biologyscience.com/>
3. <http://www.allexperts.com/browse.cgi?catLvl=2&catID=229>
4. <https://www.library.qmul.ac.uk/subject-guides/biological-sciences>

PROBABILITY AND STATISTICS
(Common to CSE, IT,AIML& CSE(DS))

IVSemester
Course Code:201BS4T16

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Compute mean, median, mode, standard deviation and variance.
- CO2:** Apply various Probability distributions for both discrete and continuous random variables.
- CO3:** Compute mean and variance of sample means with replacement and without replacement and estimating maximum errors.
- CO4:** Apply various tests to test the hypothesis concerning mean, Proportion, variance.
- CO5:** Apply the concept of correlation to the given statistical data.
- CO6:** Apply the concept of regression to the given statistical data.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Unit - I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance)

Unit – II

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

Unit – III

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance – Central limit theorem (without proof)-Point and Interval estimations – Maximum error of estimate.

Unit – IV

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions, Chi-Square and F distributions.

Unit – V

Correlation and Regression: Method of least squares – Straight line - nonlinear curves– parabola -Exponential – Power curves-Correlation – Karl pearson's correlation coefficient – rank correlation – regression– regression coefficients and properties (without proof) –regression lines

Text Books:

1. Probability and Statistics for Engineers, Miller and Freund's, 7/e, Pearson,2008.
2. Fundamentals of Mathematical Statistics, S. C. Gupta and V.K. Kapoor, 11/e, Sultan Chand & Sons Publications, 2012.
3. Probability, Statistics and Random Processes, Murugesan, Anuradha Publishers, Chennai

Reference Books:

1. Probability, Statistics and Random processes, T.B. Veeraju, TMH.
2. Probability and statistics by T.K.V. Iyengar, S. Chand publishers.
3. Higher engineering mathematics by John Bird, 5th edition Elsevier Limited, 2006.

Web Links:

1. https://en.wikipedia.org/wiki/Probability_and_statistics
2. <http://mathworld.wolfram.com/topics/ProbabilityandStatistics.html>
3. <http://nptel.ac.in/courses/111105041/1>

FORMAL LANGUAGES AND AUTOMATA THEORY

IVSemester
Course Code:201CS4T05

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply the properties of languages and automata to solve a given problem.
- CO2:** Construct an automata for a given language.
- CO3:** Design grammars for a given language.
- CO4:** Apply interconversion on automata, grammar and regular expressions.
- CO5:** Analyze decidability and undecidability problems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	-	-	-	-	-	-	-	-	-
CO2	1	2	1	-	-	-	-	-	-	-	-	-
CO3	1	2	1	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	2	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with ϵ -Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

Unit - II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

Unit - III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, ϵ -Productions and Unit Productions, Normal Forms-Chomsky Normal form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

Unit – IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

Unit – V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008

Reference Books:

1. Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007
2. Elements of Theory of Computation, Lewis H.P. & Papadimitriou C.H., Pearson /PHI
3. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014
4. Theory of Computation, V. Kulkarni, Oxford University Press, 2013

Web Links:

1. <http://nptel.ac.in/courses/111103016/>
2. <https://nptel.ac.in/courses/106/104/106104148/>
3. <https://www.iitg.ac.in/dgoswami/Flat-Notes.pdf>
4. <https://www.ics.uci.edu/~goodrich/teach/cs162/notes/>
5. <https://www.geeksforgeeks.org/introduction-of-finite-automata/>

DATABASE MANAGEMENT SYSTEMS
Common to CSE&IT

IVSemester
Course Code: 201CS4T06

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Summarize the database characteristics and architectures.
- CO2:** Implement relational database using SQL.
- CO3:** Design Entity – relationship diagrams for given scenarios.
- CO4:** Apply normalization techniques for efficient database design.
- CO5:** Analyze the mechanisms of transaction management, storage management and indexing.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	1	1	-	-	-	-	-	-	1
CO3	2	2	2	-	-	-	-	-	-	-	-	1
CO4	2	2	3	-	-	-	-	-	-	-	-	1
CO5	2	2	-	1	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	3	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Unit - II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance

BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

Unit – III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

Unit – IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

Unit – V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2. Database System Concepts, 5/e, Silberschatz, Korth, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. <https://www.geeksforgeeks.org/introduction-to-nosql/>
3. <https://beginnersbook.com/2015/05/normalization-in-dbms/>

JAVA PROGRAMMING

Common to CSE&IT

IVSemester
Course Code:201CS4T07

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply Java features for problem solving.
- CO2:** Build applications using principles of OOPs, interfaces and Packages.
- CO3:** Develop programs using Exception Handling to handle run-time errors.
- CO4:** Develop applications using multithreading for inter thread communication.
- CO5:** Build JDBC applications for performing CRUD operations using MySQL.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	2	1	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-
CO5	2	2	3	-	1	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	3	-

Unit – I

Introduction to Java: History of Java, Java Features, Program Structure, Command Line Arguments, User Input to Programs. Building Blocks of Java: Identifiers, Data types, Literal Constants, Variables and its Scope, Formatted Output with printf() Method, Operators, Precedence and Associativity of Operators, Type Casting. Control Statements: Selection Statements: if-else, switch, Iteration Statements: while, do-while, for, for each, Transfer Statements: Break, Continue

Unit – II

Arrays: Introduction, Declaration and Initialization of Arrays, Accessing Elements of Array. Operations on Array Elements, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Multi-dimensional arrays. Classes, Objects and Methods: Class Declaration, Creating Objects, Assigning One Object to Another, Methods, Constructors, this keyword, static keyword, final keyword, garbage collector, Access Control, Method Overloading, Constructor Overloading, Parameter Passing, Nested Classes. String Handling: StringClass, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Searching Strings, Methods for Modifying Strings, String Buffer Class and its methods, Class String Builder.

Unit – III

Inheritance: Inheritance, Types of Inheritance, Constructor Method and Inheritance, Super keyword, Method Overriding, Dynamic Method Dispatch, Inhibiting Inheritance of Class Using Final, Abstract Classes. Interfaces- Defining an interface, Implementing interfaces through classes, Multiple inheritance through interfaces.

Unit – IV

Packages: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Specifiers, java.lang package, Wrapper Classes. Exception Handling: Introduction, Importance of try, catch, throw, throws and finally block, Multiple Catch Clauses, Rethrowing Exception, Nested try and catch Blocks, Unchecked Exceptions, Checked Exceptions, Custom Exceptions.

Unit – V

Multithreading: Introduction, Thread Life Cycle, Creation of Threads, Thread Priorities, Thread Synchronization, Inter-thread Communication- Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application.

Text Books:

1. The Complete Reference Java, Herbert Schildt, 8th Edition, TMH, 2014.
2. Java one step ahead, Anita seth, B.L.Juneja, First Edition, Oxford, 2017.

Reference Books:

1. .Introduction to java programming, by Y Daniel Liang, Seventh Edition, Pearson, 2017.
2. Core Java: An Integrated Approach, R.Nageswara Rao, Dream tech press, 2008.
3. Thinking in Java – Bruce Eckel, Fourth Edition, Prentice Hall, 2002.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. <http://java.sun.com/docs/books/tutorial/>
3. <http://www.tutorialspoint.com/java>
4. <http://www.javatpoint.com>
5. <http://www.w3schools.com/java>

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
Common to CSE&IT

IVSemester
Course Code:201HS4T03

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO 1: Explain the Managerial Economic concepts for decision making and forward planning.
- CO 2: Illustrate the law of demand and its exceptions by using different forecasting methods.
- CO 3: Identify the production , cost behavior for managerial decision making and Break Even Point (BEP) of an enterprise.
- CO 4: Differentiate types of market structures, business organizations along with basic knowledge on business cycle.
- CO 5: Make use of the process & principles of accounting for the preparation of final accounts.
- CO 6: Utilize various techniques on investment project proposals with the help of capital budgeting techniques for decision making.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	1	-	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	-	-	-	-	-	1	1	-	-
CO5	1	-	-	-	-	-	-	-	3	1	2	-
CO6		-	-	-	-	-	-	-	1	2	3	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction To Managerial Economics and Demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of DemandDemand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types and Measurement-Demand forecasting and its Methods.

Unit - II

Concept of Production Function- Cobb-Douglas Production function – Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale- Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)- Managerial significance and limitations of Breakeven point.

Unit – III

Introduction to Markets, Pricing Policies & Types of Business Organization and Business Cycles: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, and Internet Pricing: Flat Rate Pricing, Usage sensitive pricing and Priority Pricing. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – Business Cycles: Phases of Business Cycles

Unit – IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry Systems – Journal entries – Ledger – Trail Balance – Trading and Profit and Loss Account - Preparation of Financial Statements - Introduction to Ratio Analysis

Unit – V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index).

Text Books:

1. Managerial Economics and Financial Analysis, Dr. A. R. Aryasri, TMH 2011
2. Managerial Economics and Financial Analysis, Dr. N. AppaRao, Dr. P. Vijay Kumar, Cengage Publications, New Delhi – 2011.
3. Managerial Economics and Financial Analysis, Prof. J.V.Prabhakararao, Prof. P. Venkataraao , Ravindra Publication.

Reference Books:

1. V. Maheswari : Managerial Economics, Sultan Chand.
2. Suma Damodaran : Managerial Economics, Oxford 2011.
3. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
4. VanithaAgarwal : Managerial Economics, Pearson Publications 2011

Web Links:

1. www.managementstudyguide.com
2. www.tutorialspoint.com

DATABASE MANAGEMENT SYSTEMS LAB
Common to CSE&IT

IVSemester
Course Code: 201CS4L04

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Construct a database schema for a given problem-domain.
- CO2:** Apply database language commands to create simple database.
- CO3:** Apply integrity constraints on a database using RDBMS.
- CO4:** Analyze the database using queries to retrieve records.
- CO5:** Design Entity – relationship diagrams for given scenarios.
- CO6:** Develop PL/SQL stored procedures, stored functions, cursors and packages.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	-	-	-	1	2	-	-
CO2	2	1	1	1	1	-	-	-	1	2	-	-
CO3	2	2	1	1	3	-	-	-	1	2	-	-
CO4	2	2	1	1	3	-	-	-	1	2	-	1
CO5	2	2	1	1	3	-	-	-	1	2	-	-
CO6	2	2	1	1	3	-	-	-	1	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	2	-
CO5	1	-
CO6	2	-

List of Experiments:

Week – 1

Queries for Creating, Altering and Dropping Tables, Views and Constraints.

Week – 2

Queries to Retrieve and Change Data: Select, Insert, Delete and Update.

Week – 3

3.1) Queries to facilitate acquaintance of Built-in Functions: String Functions, Numeric Functions, Date Functions and Conversion Functions. 3.2) Queries using operators in SQL.

Week – 4

4.1) Queries using Group By, Order By, and Having Clauses. 4.2) Queries on Controlling Data: Commit, Rollback, and Save point.

Week – 5

Queries on Joins and Correlated Sub-queries.

Week – 6

Queries on Working with Index, Sequence, Synonyms.

Week – 7

Queries to Build Views.

Week – 8

Write a PL/SQL Code using Basic Variables and Usage of Assignment Operation.

Week – 9

Write a PL/SQL Code to Bind and Substitute variables in PL/SQL.

Week – 10

Write a PL/SQL block using SQL and Control Structures.

Week – 11

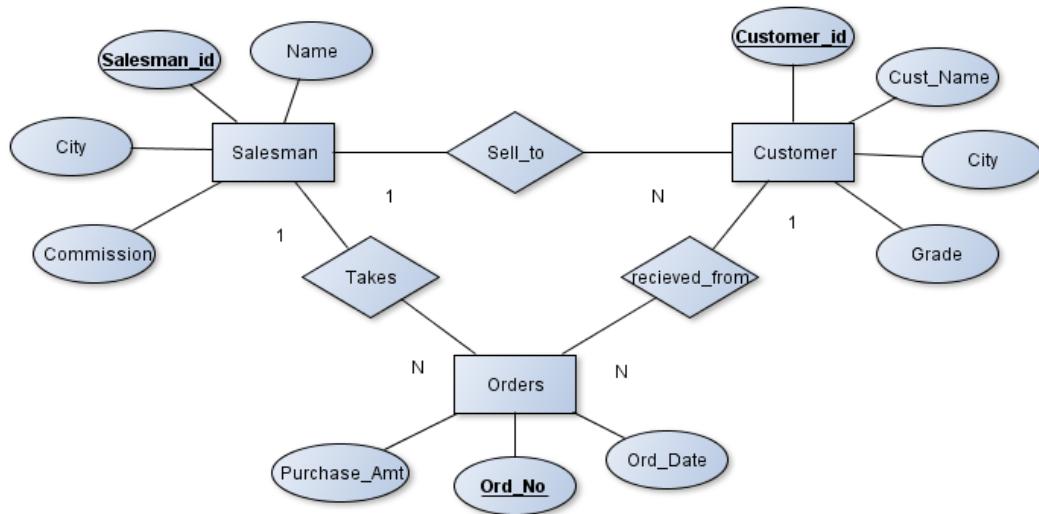
Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types.

Week – 12

Write a PL/SQL Code using Procedures, Functions, Packages.

List of Augmented Experiments:

13. For a Sales Order Database System, based on the given E-R diagram.



a)Design a schema by applying functional dependencies.

b)Apply constraints and verify them.

14. Based on the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)

BOOK_AUTHORS (Book_id, Author_Name)

PUBLISHER (Name, Address, Phone)

BOOK_COPIES (Book_id, Branch_id, No-of_Copies)

BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date)

LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

a. Draw the E-R diagram and show the necessary multiplicity and associations among them.

b. Draw the Schema diagram and show the necessary associations among them.

15. For a Faculty Database

EMPLOYEE (EMPID, FName, LName, Address, Sex, Salary, DeptNo)

DEPARTMENT (DeptNo, DName, HOD_EMPID)

PROJECT (ProjNo, PName, DeptNo)

WORKS_ON (EMPID, ProjNo, Hours)

EMPLOYEE DATA

EMPID	FName	LName	Address	Sex	Salary	DeptNo
1201	Adarsh	Kumar	Kakinada	F	150000	1
1240	Mahi	John	Rajahmundry	F	95000	1
1245	Ramu	Murty	Rajahmundry	M	90000	2
1234	Aditya	Surya	Banglore	M	80000	1
1247	Jack	Paul	Banglore	M	75000	2
1235	Pradeep	Chitra	Rajahmundry	M	78000	1
1211	Srinivas	Kumar	Hyderabad	M	59000	1
1492	Gopala	Rao	Kakinada	M	65000	2
1250	Eswari	Nirupama	Kakinada	F	65000	2

DEPARTMENT DATA

DeptNo	DName	HOD_EMPID
1	CSE	1240
2	IT	1245

PROJECT DATA

ProjNo	PName	DeptNo
100	IoT	1
101	CLOUD	1
102	BIGDATA	2
103	NETWORKS	2
104	IOT	2
105	NETWORKS	1

WORKS_ON DATA

EMPID	ProjNo	Hours
1245	104	16
1240	101	22
1201	100	31
1250	102	25
1492	103	25
1235	105	29

With the sample data Write SQL queries to

- To Show the resulting salaries if every employee working on the ‘IoT’ project is given a 10 percent raise.
- Find the sum of the salaries of all employees of the ‘IT’ department, as well as the maximum salary, the minimum salary, and the average salary in this department.

16. For a Movie Database:

ACTOR (Act_id, Act_Name, Act_Gender)

DIRECTOR (Dir_id, Dir_Name)

MOVIES (Mov_id, Mov_Title, Mov_Year, Dir_id)

MOVIE_CAST (Act_id, Mov_id, Role)

RATING (Mov_id, Rev_Stars)

With the sample data Write SQL queries to

- List the titles of all movies directed by ‘STEVEN SPIELBERG’.
- Find the movie names where one or more actors acted in two or more movies.

3. List all actors who acted in a movie before 2015 and also in a movie after 2015 (use JOIN operation).
4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

ACTOR DATA

Act_id	Act_Name	Act_Gender
01	DICAPRIO	M
02	KATE WINSLET	F
103	SAM WORTHINGTON	M
104	SAM NEIL	M
105	CATE BLANCHETT	F
106	CHRIS PRATT	M
107	BRYCE DALLAS	F
108	LAURA DERN	F
109	DANIEL YORK	F

DIRECTOR DATA

Dir_id	Dir_Name
10	STEVEN SPIELBERG
11	JAMES CAMERON
12	MARTIN SCORSESE
13	BAZ LUHRMANN
14	CHRISTOPHER NOLAN
15	COLIN TREVORROW
16	RIDLEY SCOTT

MOVIES DATA

Mov_id	Mov_Title	Mov_Year	Dir_id
1001	JURASSIC PARK	1993	10
1002	TITANIC	1997	11
1003	THE AVIATOR	2004	12
1004	BODY OF LIES	2008	16
1005	AVATAR	2009	11
1006	INCEPTION	2010	14
1007	THE GREAT GATSBY	2013	13
1008	JURASSIC WORLD	2015	15
1009	THE BFG	2016	10
1010	THE POST	2017	10

MOVIE_CAST DATA

Act_id	Mov_id	Role
104	1001	HERO
108	1001	HEROINE
101	1002	HERO
102	1002	HEROINE
101	1003	HERO
109	1003	HEROINE
101	1004	HERO
103	1005	HERO
101	1006	HERO
101	1007	HERO
106	1008	HERO
107	1008	HEROINE

RATING DATA

Mov_id	Rev_stars
1001	5
1002	6
1003	3
1004	4
1005	4
1006	2
1007	2
1008	6
1009	4
1010	2

Reference Books:

1. SQL, PL/SQL The programming language of ORACLE, Ivan Bayross, Fourth edition, BPB Publication, 2009
2. SQL/PLSQL for ORACLE 9i, P.S.Deshpande, Dreamtech Press, 2003.
3. Teach yourself PL/SQL in 21 days, Tom Luers, Timothy Atwood and Jonatham Gennick, First Edition, Techmedia, 1997.

Web Links:

1. <http://nptel.ac.in/courses/106106093/6>

2. <http://www.tutorialspoint.com/plsql/>
3. <https://www.plsql.co/>
4. <https://www.w3schools.com/sql/>
5. <http://www.oracle.com/technetwork/database/features/plsql/index.html>

JAVA PROGRAMMING LAB
Common to CSE&IT

IVSemester
Course Code:201CS4L05

L	T	P	C
0	0	0	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply class, inheritance, and interface for problem solving.
- CO2:** Build applications using packages to group liked classes.
- CO3:** Develop error free programs using exception handling.
- CO4:** Develop a solution for ITC using multithreading.
- CO5:** Apply event handling for interactive applications.
- CO6:** Develop JDBC applications for performing CRUD operations using MySQL

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	-	-	-	1	2	-	2
CO2	2	2	2	1	-	-	-	-	1	2	-	2
CO3	2	3	3	1	-	-	-	-	1	2	-	2
CO4	2	2	3	1	-	-	-	-	1	2	-	2
CO5	2	2	3	1	-	-	-	-	1	2	-	2
CO6	2	2	3	1	2	-	-	-	1	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week – 1

- 1) Basic Programs
 - 1.1)Write a Java program to display default value of all primitive data type of JAVA
 - 1.2)Write a Java program to find the discriminant value D and find out the roots of the quadratic equation of the form $ax^2+bx+c=0$.
 - 1.3)Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Week – 2

- 2) Control Flow Statements
 - 2.1)Write a Java program to select all the prime numbers within the range of 1 to 100.
 - 2.2)Write a Java program to Find the sum of all even terms in the Fibonacci sequence up to the given range N.
 - 2.3)Write a Java program to check whether a given number is Armstrong or not.

Week – 3

- 3) Arrays

- 3.1)Write a Java program to implement binary search.
- 3.2)Write a Java program to sort for an element in a given list of elements using bubble sort.
- 3.3)Write a Java program to sort for an element in a given list of elements using merge sort.

Week – 4

4) Class Mechanism

- 4.1)Write a Java program to display the details of a person. Personal details should be given in one method and the qualification details in another method.
- 4.2)Write a Java program to implement constructor and constructor overloading.
- 4.3)Write a Java program to implement method overloading.

Week – 5

5) Strings

- 5.1)Write a Java program to sort given set of strings.
- 5.2)Write a Java program for using String Buffer to remove or delete a character.

Week – 6

6) Inheritance

- 6.1)Write a Java program to implement Single Inheritance.
- 6.2)Write a Java program to implement multi level Inheritance.
- 6.3)Write a Java program to find the areas of different shapes using abstract classes.

Week – 7

7) Inheritance-continued

- 7.1)Write a Java program for “super” keyword.
- 7.2)Take the details of internal exam marks in one Interface. Take the details of external exam marks in another interface. Write a Java program to find the total marks obtained in each subject by a student. (Note: Make use of Multiple Inheritance using interfaces.)
- 7.3)Write a JAVA program that implements Runtime polymorphism

Week – 8

8) Packages

- 8.1)Write a Java program that import and use user defined package.
- 8.2)Write a Java program to illustrate the use of protected members in a package.

Week – 9

9) Exception Handling

- 9.1)Write a Java program to illustrate exception handling mechanism using multiple catch clauses.
- 9.2)Write a Java program to make use of Built-in and user-defined Exceptions in handling a run time exception.

Week – 10

10) Multithreading

- 10.1)Write a Java program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable).
- 10.2)Write a Java program to solve Producer-Consumer problem using synchronization.

Week – 11

11) Event Handling

- 11.1) Write a Java program to illustrate the Keyboard Events by using an applet code
- 11.2) Write a Java program to illustrate the Mouse Events by using an applet code.
- 11.3) Write a Java program to generate a simple calculator using AWT components.

Week – 12

- 12)Write a JDBC program to perform the following operations by connecting to MYSQL database.
- 12.1)Inserting Data into Table
- 12.2)Updating Data in the Table.
- 12.3)Deleting Data From the Table based on a column value.

List of Augmented Experiments:

- 13)Create an interface which consists of methods called no of watts consumabl, luminescent value, efficiency in percentage. Write classes for different categoriesof bulbs like LED, tube light and find out which light is efficient in terms ofconsumption.
- 14)Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in selected color.
- 15)Write a Javaprogram to display analog clock using Applet.
- 16)Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.

Reference Books:

1. Java How to Program, H.M.Ditel and P.J.Ditel, Pearson Education/PHI, SixthEdition 2007.
2. Core Java: An Integrated Approach–R.Nageswara Rao, First Edition, JohnWileyandSonsInc.,2015.
3. Java Tutorial: A Short Note on Basics-Sharon BioccaZakhour, Soumya Kannan,Raymond Gallardo– Fifth Edition, Oracle Corp,2012.
4. Object Oriented Programming using Java–Simon Kendal, First Edition, 2009.
5. Java:Thefundamentals of Objectsand Classes– DavidEtheridge,FirstEdition,2009.

Web Links:

1. <http://www.programmingtutorials.com/java.aspx>
2. <http://www.javacodegeeks.com>
3. <http://java.sun.com/developer/onlineTraining/>
4. <http://java.sun.com/learning>
5. <http://www.kodejava.org>

R PROGRAMMING LAB
(Common to CSE, IT & AIML)

IVSemester
Course Code:201CS4L06

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make use of online resources for R and import new function packages into the R workspace.
- CO2:** Design visualizations with R.
- CO3:** Develop R programs on vectors and matrices.
- CO4:** Build R programs using arrays.
- CO5:** Design Dataframes in R.
- CO6:** Apply lists and factors in realtime applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	-	-	-	1	2	-	1
CO2	2	2	2	1	1	-	-	-	1	2	-	1
CO3	2	2	2	1	1	-	-	-	1	2	-	1
CO4	2	2	2	1	1	-	-	-	1	2	-	1
CO5	2	2	1	1	1	-	-	-	1	2	-	1
CO6	3	2	2	1	1	-	-	-	1	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week – 1

- 1)Built in functions 1.1)Calculate the cumulative sum(“running total”)of the numbers 2,3,4,5,6 1.2) Print the 1 to 10 numbers in reverse order.

Week – 2

- 2) Basic Programs
 - 2.1)Write a R program to take input from the user (name and age) and display the values.Also print the version of R installation.
 - 2.2) Write a R program to get the details of the objects in memory.
 - 2.3) Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.

Week – 3

- 3)Graphics Write a R program to create a simple bar plot of five subjects marks

Week – 4

- 4)Vectors

4.1) Write a R program to get the unique elements of a given string and unique numbers of vector.

4.2) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.

4.3) Write a R program to create a matrix from a list of given vectors.

Week – 5

5) Vectors-continued 5.1) Write a R program to append value to a given empty vector. 5.2) Write a R program to multiply two vectors of integers type and length 3. 5.3) Write a R program to find Sum, Mean and Product of a Vector, ignore element like A or NaN.

Week – 6

6)Matrices

6.1) Write a R program to create a 5×4 matrix , 3×3 matrix with labels and fill the matrix by rows and 2×2 matrix with labels and fill the matrix by columns.

6.2) Write a R program to create a two-dimensional 5×3 array of sequence of even integers greater than 50.

6.3) Write a R program to find row and column index of maximum and minimum value in a given matrix

Week – 7

7)Arrays 7.1) Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array. 7.2)Write a R program to create an array using four given columns, three given rows, and two given tables and display the content of the array.

Week – 8

8)Data frame-I 8.1) Write a R program to create an empty data frame. 8.2) Write a R program to create a data frame from four given vectors.

Week – 9

9) Data frame-II 9.1) Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame. 9.2) Write a R program to save the information of a data frame in a file and display the information of the file.

Week – 10

10)Lists 10.1) Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list. 10.2) Write a R program to create a list containing a vector, a matrix and a list and remove the second element. 10.3) Write a R program to select second element of a given nested list.

Week – 11

11)Lists-continued

11.1) Write a R program to merge two given lists into one list.

11.2) Write a R program to create a list named s containing sequence of 15 capital letters, starting from 'E'.

11.3) Write a R program to assign new names "a", "b" and "c" to the elements of a given list.

Week – 12

12)Factors 12.1) Write a R program to find the levels of factor of a given vector. 12.2) Write a R program to create an ordered factor from data consisting of the names of months. 12.3) Write a R program to concatenate two given factor in a single factor.

List of Augmented Experiments:

13. The number below are the first ten days of rain fall amounts in 1996. Read them into a vector using c() function 0.1,0.6,33.8,1.9,9.6,4.3,33.7,0.3,0.0,0.1 Inspect the data and answer the following questions:
a.what was the mean rainfall,how about the standard deviation? b.calculate the cumulative rainfall("running total")over these ten days.confirm that the last value of the vector that this produces is equal to the total sum of the rainfall. c.which day saw the highest rainfall?hintwhich.max()
14. The weights of five people are given before and after a diet programme are given in the table.
Before 78 72 78 79 105

After 67 65 79 70 93

Read the Before and after values into two different vectors called before and after .use R to evaluate the amount of weight lost for each participant.what is the average amount of weight lost

15. Consider $A=matrix(c(2,0,1,3),ncol=2)$ and $B=matrix(c(5,2,4,-1),ncol=2)$ a.find $A+B$ b.find $A-B$
16. Consider a vector $1:K$,where K is a positive integer.Write an R command that determines how many elements in the vector are exactly divisible by 3.

Reference Books:

1. Probability And Statistics For Engineering And Sciences, Jay L. Devore, Eighth Edition, Cengage Learning
2. R Cookbook, Paul Teator, Oreilly
3. R In Action, Rob Kabacoff, Manning.
4. R For Everyone, Lander, Second Edition, Pearson.
5. The Art Of R Programming, Norman Matloff, No Starch Press.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
2. <https://www.coursera.org/projects/getting-started-with-r>
3. <https://www.geeksforgeeks.org/r-programming-language-introduction/>
4. <https://www.udacity.com/course/data-analysis-with-r--ud651>

**WEB APPLICATION DEVELOPMENT USING FULL STACK
FRONTEND DEVELOPMENT MODULE – 2**
Common to CSE&IT
Skill Oriented Course- II

IV Semester
Course Code: 201CS4S01

L T P C
 0 0 4 2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Build a web page by embedding JavaScript to invoke programming ability.
- CO2:** Make use of Pre-defined JavaScript objects properties and methods
- CO3:** Experiment with JavaScript to develop dynamic web pages.
- CO4:** Choose the appropriate properties and methods to design custom objects.
- CO5:** Develop applications using the event handling in JavaScript.
- CO6:** Make use of Java Script to validate form elements.

Mapping of course outcomes with program outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	2	-	-	-	2	2	-	2
CO2	2	3	2	-	2	-	-	-	2	2	-	2
CO3	2	1	3	2	3	-	-	-	2	2	-	2
CO4	2	1	3	2	3	-	-	-	2	2	-	2
CO5	2	3	3	-	3	-	-	-	2	2	-	2
CO6	2	2	3	-	2	-	-	-	2	2	-	2

Mapping of course outcomes with program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Perform experiments related to the following concepts:

JavaScript:

Introduction to JavaScript, Applying JavaScript - internal and external, Understanding JS Syntax, Introduction to document and window Object, Variables and Operators, Data Types, Pop-up boxes, Input and Output, Num Type Conversion, Math and String Manipulation, Arrays, Date and Time, Conditional Statements, Switch Case, Looping in JS, Functions, Objects, Events.

List of Experiments:

- Experiment 1:** **Introduction to JavaScript, Applying JavaScript - internal and external, Understanding JS Syntax**
- Explain the importance of JavaScript.

- b. What JavaScript can do?
- c. Write a program to explain how to use JavaScript in a web page.
- d. Write a program to explain how to link an external JavaScript page to a HTML page.

Experiment 2: Introduction to document object

- a. Explain JavaScript document object with properties and methods.
- b. Write a JavaScript program to explain the usage of Document object properties.
 - i. document
 - ii. length
 - iii. name
 - iv. parent
 - v. status
 - vi. screenX, screenY
- c. Write a JavaScript program to explain the usage of Document object methods.
 - i. open()
 - ii. close()
 - iii. write() & writeln()
 - iv. getElementById()
 - v. getElementByName()
 - vi. getElementsByTagName()

Experiment 3: Introduction to window object

- a. Explain JavaScript window object with properties and methods.
- b. Write a JavaScript program to explain the usage of window object properties.
 - i. title
 - ii. url
 - iii. cookie
 - iv. last modified
 - v. domain
 - vi. readyState
- c. Write a JavaScript program to explain the usage of Document object methods.
 - i. open()
 - ii. close()
 - iii. print()
 - iv. stop()
 - v. focus()
 - vi. setInterval(), setInterval()

Experiment 4: Variables and Operators, Data Types and Pop-up boxes

- a. Write a JavaScript program to explain different types of variable. Write the differences between variables created with var, let, const keywords.
- b. Write a JavaScript program to explain data types with example program.
- c. Write a program to explain the Pop-up boxes in JavaScript. (prompt box, alert box and confirm box).
- d. Create a webpage which uses prompt dialogue box to ask a user for their name, age and salary. Display the information they enter on the page formatted as a small table.

Experiment 5: Input and Output statements, Num Type Conversion

- a. Write a JavaScript program to explain the different ways for displaying output.
- b. Write a JavaScript program to explain the different ways for taking input.
- c. Write a program that uses JavaScript that adds some numbers together using number conversion, concatenates a couple of strings and then shows the result in an alert dialogue box and on the page. (Hint: Use parseInt() for converting string input to integer to add 2 integers)

Experiment 6: Math and String Manipulation

- a. Write a JavaScript program to explain the use of a Math object.
 - i. properties - PI, SQRT2
 - ii. functions – round(), ceil(), floor(), trunc(), random(), max(), min(), pow(), sqrt(), parseInt(), parseFloat()
- b. Write a JavaScript program to explain the use of String object.
 - i. properties - length
 - ii. functions – charAt(), concat(), indexOf(), lastIndexOf(), split(),

trim(), slice(), substr(), substring(), toLowercase(), toUppercase(), replace().

Experiment 7: Arrays, Date and Time

- a. Write a program to explain the concept of Arrays. How to create, access an array, adding elements to array, searching element in an array, removing array numbers and sorting the numbers .
- b. Write a JavaScript program to explain about Array object.
 - i. properties - length
- c. functions - concat(), join(), pop(), push(), reverse(), shift(), slice(), sort(), splice(), unshift()
- d. Write a JavaScript program to explain about Date object.

Experiment 8: Conditional Statements, switch

- a. Write a program to demonstrate the conditional statements – if, if else, else if ladder.
- b. Write a script that reads an integer and determines and displays whether it is an odd or even number.
- c. Write a javascript which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words “LARGER NUMBER” in an information message dialog. If the numbers are equal, output HTML text as “EQUAL NUMBERS”.
- d. Write a JavaScript program to display week days using switch case.

Experiment 9: Loops

- a. Write a JavaScript program to print 1 to 10 numbers using for, while and do-while loops.
- b. Write a JavaScript program to print data in object using for-in, for-each and for-of loops
- c. Develop a javascript to determine whether a given number is an ‘ARMSTRONG NUMBER’ or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e., $1^3 + 5^3 + 3^3 = 153$]

Experiment 10: Functions and Objects

- a. Write a program to explain the concept of functions. Define a function, pass parameters, return values, local and global scope.
- b. Design a appropriate JavaScript function should be called to display
 - i. Factorial of that number
 - ii. Fibonacci series up to that number
 - iii. Prime numbers up to that number
 - iv. Is it palindrome or not

Experiment 11: Objects

Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

Experiment 12: Events

- a. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
 - i. Factorial of that number
 - ii. Fibonacci series up to that number

- iii. Prime numbers up to that number
- iv. Is it palindrome or not

- b. Write a JavaScript to validate the following fields in a registration page created in Experiment 2
 - i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
 - ii. Mobile (only numbers and length 10 digits)
 - iii. E-mail (should not contain invalid email addresses)

Experiment List of Augmented Experiments: (Any 2 must be completed)

13-16:

- 13. Write a JavaScript that takes a number from one text field in the range of 0-999 and display it in other text field in words. If the number is out of range, it should show “out of range” and if it is not a number, it should show “not a number” message in the result box.
- 14. Write a javascript to display the denomination of the amount deposited in the bank in terms of 100’s, 50’s, 20’s, 10’s, 5’s, 2’s & 1’s. (Eg: If deposited amount is Rs.163, the output should be 1-100’s, 1-50’s, 1-10’s, 1-2’s & 1-1’s)
- 15. Write a JavaScript to validate all the fields in a registration form.
- 16. Write JavaScript programs on Event Handling
 - i. Open a Window from the current window
 - ii. Change color of background at each click of button or refresh of a page
 - iii. On Mouse over event.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
3. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.

Web Links:

1. <https://www.w3schools.com/html>
2. <https://www.w3schools.com/css>

APPLICATIONS OF PYTHON-PANDAS
Common to CSE&IT
Skill Oriented Course- II

IVSemester
Course Code:201CS4S02

L **T** **P** **C**
 0 0 4 2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Use Pandas to create and manipulate data structures like Series andDataFrames.
- CO2:** Experiment with arrays, queries, and dataframes
- CO3:** Apply dataframe structures for cleaning and processing data.
- CO4:** Apply dataframe structures for manipulatingfiles.
- CO5:** Develop basic charts to display data from dataframes.
- CO6** Make use of Pandas to load data set and perform data analysis, manipulation and visualization.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	-	2	2	-	-	-	1	2	-	1
CO2	1	2	-	2	3	-	-	-	1	2	-	2
CO3	1	2	-	3	2	-	-	-	1	2	-	2
CO4	1	2	-	2	3	-	-	-	1	2	-	2
CO5	1	2	-	3	2	-	-	-	1	2	-	2
CO6	1	3	-	3	2	1	-	-	1	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

List of Experiments:

Week – 1
 Pandas Installation

Week – 2
 Creating DataFrames

Week – 3
 Pandas DataSeries:
 i)Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
 ii)Write a Pandas program to convert a Panda module Series to Python list and it's type.
 iii)Write a Pandas program to add, subtract, multiple and divide two Pandas Series.

iv)Write a Pandas program to convert a NumPy array to a Pandas series.

Sample Series: NumPy array:

[10 20 30 40 50]

Converted Pandas series: 0 10

1 20

2 30

3 40

4 50

dtype: int64

Week – 4

Pandas DataFrames:

Consider Sample Python dictionary data and list labels:

```
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily',
```

```
'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'],
```

```
'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
```

```
'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
```

```
'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
```

```
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
```

i)Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.

ii)Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.

iii)Write a Pandas program to insert a new column in existing DataFrame. iv)Write a Pandas program to get list from DataFrame column headers. v)Write a Pandas program to get list from DataFrame column headers.

Week – 5

Pandas Index:

i)Write a Pandas program to display the default index and set a column as an Index in a given dataframe.

ii)Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe

Week – 6

Pandas Joining and merging DataFrame:

i)Write a Pandas program to join the two given dataframes along rows and assign all data.

ii)Write a Pandas program to append a list of dictionaries or series to a existing DataFrame and display the combined data.

iii)Write a Pandas program to join the two dataframes with matching records from both sides where available.

Week – 7

Write a NumPy program to find the number of elements of an array, length of one array element in bytes and total bytes consumed by the elements

Week – 8

Write a Pandas program to create a)Datetime object for Jan 15 2012.

b)Specific date and time of 9:20 pm.

c)Local date and time.

d)A date without time.

e)Current date.

f)Time from a datetime.

g)Current local time.

Week – 9

i)Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.

ii)Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index.

Week – 10

Pandas Grouping Aggregate:

Consider dataset:

	school	class	name	date_Of_Birth	age	height	weight	address
S1	s001	V	Alberto Franco	15/05/2002	12	173	35	street1
S2	s002	V	Gino Mcneill	17/05/2002	12	192	32	street2
S3	s003	VI	Ryan Parkes	16/02/1999	13	186	33	street3
S4	s001	VI	Eesha Hinton	25/09/1998	13	167	30	street1
S5	s002	V	Gino Mcneill	11/05/2002	14	151	31	street2
S6	s004	VI	David Parkes	15/09/1997	12	159	32	street4

i)Write a Pandas program to split the following dataframe into groups based on school code. Also check the type of GroupBy object.

ii)Write a Pandas program to split the following dataframe by school code and get mean, min, and max value of age for each school.

Week – 11

i) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.

ii) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.

Week – 12

Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight dataframe's specific columns.

List of Augmented Experiments:

13.i)Write a Pandas program to import excel data into a Pandas dataframe.

ii)Write a Pandas program to find the sum, mean, max, min value of a column of file.

14.Plotting:

i)Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.

ii)Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.

iii)Write a Pandas program to create a stacked histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates with more bins.

15.Pandas String and Regular Expressions:

i)Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.

ii)Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.

16.Pandas SQL Query:

i)Write a Pandas program to display all the records of a student file.

ii)Write a Pandas program to select distinct department id from employees file

Text Books:

1. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPythonby Wes Mc Kinney, O'Reilly Media

Reference Books:

1. Learning the Pandas Library, Matt Harrison
2. Hands-On Data Analysis with NumPy and Pandas, Curtis Miller.
3. Pandas for Everyone: Python Data Analysis Daniel Y. Chen

Web Links:

1. <https://pandas.pydata.org/>
2. <https://www.w3schools.com/python/pandas/default.asp>
3. https://www.tutorialspoint.com/python_pandas/index.htm

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
Common to all branches

IVSemester
Course Code:201MC4T04

L	T	P	C
2	0	0	0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Identify the concept of Traditional knowledge and its importance.
- CO2:** Explain the need and importance of protecting traditional knowledge.
- CO3:** Illustrate the various enactments related to the protection of traditional knowledge
- CO4:** Interpret the concepts of Intellectual property to protect the traditional knowledge.
- CO5:** Explain the importance of Traditional knowledge in Agriculture and Medicine.
- CO6:** Explain the Importance of conservation and sustainable development of environment.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	1	1	-	-	-	-
CO2	-	-	-	-	-	3	1	1	-	-	-	-
CO3	-	-	-	-	-	3	1	1	-	-	-	-
CO4	-	-	-	-	-	3	1	1	-	-	-	-
CO5	-	-	-	-	-	3	1	1	-	-	-	-
CO6	-	-	-	-	-	3	1	1	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge.

Unit – II

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Unit – III

Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

Unit – IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge.

Unit – V

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. Knowledge Traditions and Practices of India

Web Links:

1. <https://www.youtube.com/watch?v=LZP1StpYEPM>
2. <http://nptel.ac.in/courses/121106003/>

SOFT COMPUTING TECHNIQUES
(Honors)

IV Semester
Course Code:201CS4H01

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- CO2:** Apply fuzzy logic and reasoning to handle and solve engineering problems
- CO3:** Describe the advanced neural networks and its applications
- CO4:** Perform various operations of genetic algorithms, Rough Sets.
- CO5:** Comprehend various techniques to build model for various applications

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-
CO4	2	2	2	3	-	-	-	-	-	-	-	-
CO5	2	1	2	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Expert Systems: Introduction, Expert Systems Features, Characteristics, Development of expert system Technology, Architecture, Goals, Basic activities, Advantages, Expert systems and Conventional methods. Stages in development of expert system, Expert system Tools, Applications.

Unit – II

Fuzzy systems: Introduction, Foundations of fuzzy system, Fuzzy relations, Arithmetic operations in fuzzy relations, Defuzzification methods, Applications

Unit – III

Artificial Neural network: Introduction, Neuron Physiology, Artificial neurons, Artificial Neural networks, Features, Back propagation training algorithms

Unit – IV

Genetic algorithms and evolutionary programming: Introduction, Genetic algorithms, Procedures of genetic algorithms, working of genetic algorithms, Logic behind Gas.

Unit – V

Swarm Intelligent systems: Introduction, Background of Ant intelligent system, ant colony systems Importance, development, applications, working of ant colony systems

Text Books:

1. Soft Computing and Intelligent Systems Design Theory, Tools and Applications, Fakhreddine O. Karray and Clarence de Silva
2. Artificial Intelligence and Intelligent Systems, N. P. Padhy,Oxford University press.

Reference Books:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning
2. S. N. Sivanandam& S. N. Deepa, “Principles of Soft Computing”, 2nd edition, Wiley India, 2008. 2.
3. David E. Goldberg, “Genetic Algorithms-In Search, optimization and Machine learning”, Pearson Education

Web Links:

1. <http://nptel.ac.in/courses/106106168/>
2. <http://db.uwaterloo.ca/~tozsu/courses/cs454>
3. <http://cse.iitkgp.ac.in/~agupta/distsys/index.html>
4. <http://www.cis.upenn.edu/~lee/03cse380/lectures/ln19-ds-v3.4pp.pdf>

INTERNET OF THINGS (Honors)

IV Semester
Course Code:201CS4H02

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain in a concise manner how the general Internet as well as Internet of Things work.
- CO2:** Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- CO3:** Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- CO4:** Develop prototype models for various applications using IoT technology
- CO5:** Explain in a concise manner how the general Internet as well as Internet of Things work

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	-	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-
CO3	2	3	-	2	-	-	-	-	-	-	-	-
CO4	2	3	1	2	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	1	-
CO4	1	-
CO5	2	-

Unit - I

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet

Unit – II

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems,ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

Unit – III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Unit – IV

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Unit – V

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbots and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley Getting Started with the Internet of Things, CunoPfister ,Oreilly
2. IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, rob Barton, Jerome Henry, CISCO, Pearson, 2018.
3. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc18_cs46/preview
2. <https://swayam.gov.in/courses/public?keyword=Introduction%20to%20internet%20of%20things>
3. <https://swayam.gov.in/courses/public?keyword=Design%20for%20internet%20of%20things>
4. <https://www.coursera.org/specializations/iot>

DATA STRUCTURES

(Minor)

IV Semester
Course Code:201CS4M01

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate time and space complexities of an algorithm.
- CO2:** Apply various searching and sorting techniques to solve computing problems.
- CO3:** Make use of linear data structures to solve real time problems.
- CO4:** Develop applications using Tree Data Structures.
- CO5:** Solve problems using Graph Algorithms.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	2	2	-	-	-	-	-	-	-	1
CO2	-	2	2	3	-	-	-	-	-	-	-	1
CO3	-	3	2	2	-	-	-	-	-	-	-	1
CO4	-	2	2	3	-	-	-	-	-	-	-	1
CO5	-	3	2	2	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit – I

Data Structures –Definition, Classification and Operations on Data Structures, Pseudo code, Algorithm analysis, Time and Space Complexity. Searching: Linear search, Binary search. Sorting: Insertion Sort, Selection Sort, Exchange (Bubble Sort, Quick Sort),merging (Merge sort), distribution (Radix Sort) algorithms

Unit – II

Stacks: Introduction, Array Representation of Stacks, Operations and Implementation, Applications of Stacks-Reversing list, Infix to Postfix Conversion, Evaluating Postfix Expressions. Queues: Introduction, Array Representation of Queues, Operations and Implementation, Types of Queues: Circular Queues, Deques and Priority Queues, Application of Queues

Unit – III

Linked Lists: Introduction, Singly linked list, Operations on Singly Linked list - Insertion, Deletion and Searching, Doubly linked list - Insertion, Deletion, Circular linked list-Insertion, Deletion, Linked Representation of Stacks and Queues, Applications of Linked lists-Addition of Polynomials, Sparse

Matrix Representation using Linked List

Unit – IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists, Traversing a Binary Tree(In-Order, Pre-Order,Post-Order). Binary Search Trees: Definition, Operations: Searching, Insertion, Deletion, Applications Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations

Unit – V

Graphs: Introduction, Graph Terminology, Representation of Graphs-Adjacency Matrix and using Linked list, Graph Traversals(BFT & DFT), Applications-Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's Shortest Path, Warshall's Algorithm, Transitive Closure. (Algorithmic Concepts Only, No Programs required).

Text Books:

1. Data Structures Using C, Reema Thareja, Oxford University Press, 2nd Edition.
2. Data Structures and Algorithm Analysis In C, Mark Allen Weiss, 2nd Edition.

Reference Books:

1. Fundamentals of Data Structure in C, Horowitz, Sahni, Anderson Freed, University Press, 2nd Edition, 2008.
2. Data Structures, Richard F, Gilberg, Forouzan, Cengage Learning, 2nd Edition.
3. Data Structures and Algorithms, G. A.V.Pai, TMH, 2008.

Web Links:

1. <http://nptel.ac.in/courses/106102064/>
2. <http://algs4.cs.princeton.edu/home/>
3. https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf
4. <http://www.udacity.com/>
5. <http://www.courseera.com/>

SOFTWARE ENGINEERING (Minor)

IVSemester
Course Code:201CS4M02

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain the key facts, concepts, principles, and theories of software & Software Engineering.
- CO2:** Compare various software development process models with respective to advantages, disadvantages and applicability.
- CO3:** Describe the various responsibilities and activities of Software Project Management.
- CO4:** Prepare SRS Document for any real time scenario.
- CO5:** Apply various Designs, Coding and testing Principles for developing the software products.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	1	2	-	-	-	-	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	2	-
CO3	2	2	2	-	-	-	-	-	-	-	3	-
CO4	-	1	2	-	-	-	-	-	-	-	2	-
CO5	1	2	3	-	2	-	-	-	-	-	2	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	-	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Introduction to Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths.

Software Process: Software Process, Process Classification, Phased Development LifeCycle, Software Development Process Models – Waterfall Model, Iterative Waterfall Model, Prototype Model, Incremental Model, Spiral Model, Agile Process Model and RUP process Model.

Case Study: Survey on different process models including.

- i. Advantages and Disadvantages of the models.
- ii. Applicability of the model.
- iii. Projects developed using various models.

Unit – II

Software Project Management: Project Management Essentials, What is Project Management, Software Configuration Management, Risk management.

Project Planning and Estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques.

Case Study: Estimate the effort of the software development using Functional Points and COCOMO Model for

any real time problem.

Unit – III

Requirements Engineering: Software Requirements, Requirements Engineering Process, Requirements Elicitation and Analysis, Requirements Specification, Requirements Validation, Requirements Management. **Case Study:** Create a SRS document for any one of the following Software Projects.

1. Course Registration System
2. Students Marks Analyzing System
3. Online Ticket Reservation System
4. Stock Maintenance

Unit – IV

Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles, Modular Design, Software Architecture, Design Methodologies,

Implementation: Coding Principles, Coding Process, Code Verification, and Code Documentation.

Case Study: Construct the DFD and CFD for any one of the following Software Projects.

1. Airline Reservation System
2. Students Marks Analyzing System
3. ATM System
4. Library Management System

Unit – V

Software Testing: Testing Fundamentals, Test Planning, Black-Box Testing, White Box Testing, Levels of Testing, Usability Testing, Regression Testing, Debugging Approaches.

Software Quality and Reliability: Software Quality factors, Verification & Validation, Software Quality Assurance, The Capability Maturity Model, and Software Reliability.

Case Study: Design the test cases for any one of the following real time scenarios using White Box & Black Box Testing Techniques.

1. E-Commerce application (Flipkart, Amazon)
2. Mobile Application

Text Books:

1. Software Engineering – Concepts and Practices: Ugrasen Suman, Cengage Learning.
2. Software Engineering: A practitioner's approach, Roger S. Pressman, McGrawHill.

Reference Books:

1. Software Engineering, Ian Sommerville, Ninth Edition, Pearson
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India
3. Fundamentals of Software Engineering, Rajib Mall, Prentice Hall India.
4. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill.
5. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

Web Links:

1. https://www.tutorialspoint.com/software_engineering/
2. <http://nptel.ac.in/courses/106/105/106105182/>
3. <https://www.coursera.org/learn/software-processes-and-agile-practices>
4. <http://www.geeksforgeeks.org/software-engineering-gq/>
5. <https://www.coursera.org/browse/computer-science/software-development>

COMPUTER ORGANIZATION AND ARCHITECTURE
(Minor)

IVSemester
Course Code:201CS4M03

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1: Describe the basic structure of a computer system, various number systems and arithmetic operations.
- CO2: Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses
- CO3: Demonstrate the architecture and functionality of central processing unit
- CO4: Illustrate the I/O and memory organization in an efficient way.
- CO5: Make use of multi processors and pipelining to improve the efficiency of computer system.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	1	-	-	-	-	-	-	-	-
CO2	2	1	1	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	1	2	2	-	-	-	-	-	-	-	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit – I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures. Data Representation: Data types, Complements, Fixed Point Representation. Floating – Point Representation. Other Binary Codes, Error Detection Codes. Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

Unit – II

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input – Output and Interrupt, Complete Computer Description,

Unit – III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer. Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

Unit – IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

Unit – V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGraw Hill, 2002.

Reference Books:

1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105163/>
2. <https://nptel.ac.in/courses/106/106/106106092/>
3. <https://www.udemy.com/course/computer-architecture-computer-organization-course/>
4. <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>

COMPUTER NETWORKS

Common to CSE&IT

VSemester
Course Code: 201CS5T01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Describe network topologies, reference models and media for data transmission.
- CO2:** Analyze error and flow control issues in data link layer.
- CO3:** Classify MAC protocols and wired LAN technologies based on performance.
- CO4:** Apply routing algorithms and congestion control techniques for effective data transmission.
- CO5:** Analyze protocols used in the layers of reference models.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	2	3	1	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model, the TCP/IP Reference Model , A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.

Physical Layer: Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

Unit – II

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel.Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol,

Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

Unit – III

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance,

Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

Unit – IV

The Network Layer Design Issues: Store and Forward Packet Switching, Services Provided to the Transport layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms: The Optimality principle, Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms: General principles of congestion control, Congestion prevention policies, Approaches to Congestion Control, Traffic Aware Routing, Admission Control, Traffic Throttling, Load Shedding, Traffic Control Algorithm:Leaky bucket & Token bucket.

Internet Working: Network layer in the internet, IP protocols: IP Version 4,IP Version 6,Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6,Internet control protocols: ICMP, ARP, DHCP

Unit – V

The Transport Layer: Transport layer protocols: Introduction, services, port number, User data gram protocol: UDP services, UDP applications,

Transmission control protocol: TCP services, TCP features, Segment, A TCP connection, windows in TCP, flow control, Error control, Congestion control in TCP.

Application Layer: World Wide Web: HTTP, Electronic mail, Architecture, web based mail, email security, TELENET, local versus remote Logging, Domain Name System: Name Space, DNS, SNMP.

Text Books:

1. Computer Networks — Andrew S Tanenbaum and David J Wetherall, 5th Edition, Pearson Education, 2013.
2. Data Communications and Networking – Behrouz A. Forouzan, 5th Edition, McGraw Hill Education, 2012.

Reference Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE
3. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.

Web Links:

1. <https://nptel.ac.in/courses/106105081>
2. <https://www.coursera.org/learn/fundamentals-network-communications>
3. <https://nptel.ac.in/courses/106/106/106106091/>
4. <https://www.udemy.com/course/mta-networking-fundamentals/>

DESIGN AND ANALYSIS OF ALGORITHMS

VSemester
Course Code: 201CS5T02

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Interpret the performance of an algorithm using algorithm analysis techniques.
- CO2:** Solve problems using divide and conquer design strategy.
- CO3:** Apply greedy method and dynamic programming to provide optimal solutions.
- CO4:** Use Backtracking approach to solve decision making problems.
- CO5:** Classify NP-Complete and NP-Hard Problems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	1
CO2	3	1	1	2	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	2	1	2	2	-	-	-	-	-	-	-	-
CO5	1	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	3	-
CO4	2	-
CO5	-	-

Unit - I

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

Unit – II

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy method: The general Method, Knapsack problem, minimum-cost spanning trees, Optimal Merge Patterns, Single Source Shortest Paths.

Unit – III

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem.

Unit – IV

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

Unit – V

NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP-Complete classes, Cook's theorem.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning.
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

1. "The Algorithm Design Manual", Steven S. Skiena, Second Edition, Springer Publication
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

Web Links:

1. <https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/pages/lecture-notes/>
2. <https://discrete.gr/complexity/>
3. <http://sofia.cs.vt.edu/cs1114-ebooklet/chapter4.html>
4. <https://nptel.ac.in/courses/106106131>

DATA WAREHOUSING AND DATA MINING
Common to CSE&IT

VSemester
Course Code: 201CS5T03

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate data warehousing architectures and mining concepts for knowledge discovery.
- CO2:** Apply pre-processing techniques to prepare data for mining algorithms.
- CO3:** Build classification model using Decision tree induction.
- CO4:** Analyze association rule generation using Apriori and FP growth algorithms.
- CO5:** Apply Clustering algorithms on given data to find similarity between classes.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	1	-	-	-	-	-	-	-
CO2	2	2	-	-	2	-	-	-	-	-	-	-
CO3	2	2	3	-	1	-	-	-	-	-	-	-
CO4	2	2	3	-	1	-	-	-	-	-	-	-
CO5	2	2	3	-	1	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit - I

Data Warehouse: Basic concepts, Data Warehouse Modelling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Implementation, Introduction: Why and What is data mining, what kinds of data need to be mined and patterns can be mined, Which technologies are used, Which kinds of applications are targeted, Major issues in data mining

Unit - II

Data Objects, Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity. An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

Unit - III

Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Scalability and Decision Tree Induction, Visual Mining for Decision Tree Induction

Unit - IV

Problem Definition, Frequent Item set Generation, Rule Generation: Confident Based Pruning, Rule Generation in Apriori Algorithm, Compact Representation of frequent item sets, FP-Growth Algorithm.

Unit - V

Overview, Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bi-secting K Means

Text Books:

1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier, 2011.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson,2012

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: Vikram Pudi and P. Radha Krishna, Oxford Publisher
3. Data Mining and Analysis - Fundamental Concepts and Algorithms;Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH

Web Links:

1. https://onlinecourses-archive.nptel.ac.in/noc19_cs15/student/home
2. http://www.saedsayad.com/data_mining_map.htm
3. <https://www.coursera.org/learn/datavisualization?specialization=data-mining>

ARTIFICIAL INTELLIGENCE
(Professional Elective-I)
Common to CSE&IT

VSemester
Course Code: 201CS5E01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Describe the evolution of Artificial Intelligence .
- CO2:** Apply searching techniques for problem solving.
- CO3:** Apply logical concepts to solve logical problems.
- CO4:** Analyze Knowledge Representation Techniques.
- CO5:** Demonstrate Expert Systems and probability theory.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	2	2	2	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit - I

Introduction to Artificial Intelligence: Introduction, Brief History, Intelligent Systems, Foundations of AI, Applications, Tic-Tac- Toe Game Playing, Development of AI Languages, Current Trends in AI.

Unit – II

Problem Solving: State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction. Problem Reduction and Game Playing: Introduction, Problem Reduction, Game Playing, Alpha-Beta Pruning, Two-Player Perfect Information Games

Unit – III

Logic Concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

Unit – IV

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Unit – V

Expert system and Applications: Introduction, phases in building expert systems, expert system architecture, expert system versus traditional systems, rule-based expert systems, application of expert systems, list of shells and tools. Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks,

certainty factor theory, dempster- shafer theory.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA.
3. Artificial Intelligence-3rd ed Rich, Kevin Knight,Shiy Shankar B Nair, TMH.
4. Introduction to Artificial Intelligence, Patterson, PHI

Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5th ed, PEA.
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer.
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105079/>
2. https://www.tutorialspoint.com/artificial_intelligence/
3. https://onlinecourses.nptel.ac.in/noc17_cs30/
4. <https://www.slideshare.net/girishnaik/artificial-intelligence-3638681>
5. <https://www.mindmeister.com/44054594/expert-systems/>

HUMAN COMPUTER INTERACTION
(Professional Elective-I)
Common to CSE&IT

VSemester
Course Code: 201CS5E02

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Outline the importance of human computer interaction for a good design.
- CO2:** Develop a GUI application for Understanding of Users.
- CO3:** Distinguish Online Vs Paper documentation in various development processes and social networking.
- CO4:** Analyze screen design of various applications in GUI and Web.
- CO5:** Compare Device based and Screen based controls.
- CO6:** Summarize effective feedback guidance and assistance.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	2	-	3	-	-	-	-	-	-	-	-	-
CO3	2	-	1	-	3	-	-	-	-	-	-	-
CO4	2	3	2	-	1	-	-	-	-	-	-	-
CO5	2	1	-	-	3	-	-	-	-	-	-	-
CO6	3	1	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	-	-
CO4	3	-
CO5	-	-
CO6	2	-

Unit - I

The User Interface: Introduction, Importance of the User Interface, Importance and benefits of Good Design, History of Human Computer Interface.

The Graphical User Interface: popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit - II

The User Interface Design Process: Obstacles and Pitfall in the development Process, Usability, The Design Team, Human Interaction with Computers, Principles of User Interface Design, Important Human Characteristics in Design, Human Consideration in Design.

Unit - III

Understanding Business Functions: Business Definitions & Requirement analysis, Determining Business Functions, Design standards or Style Guides, System Training and Documentation.

Unit - IV

Principles of Good Screen Design: Human considerations in screen Design, interface design goals, test for a good design, Technological considerations in Interface Design.

System Menus and Navigation Schemes: Structure, Functions, Context, Formatting, Phrasing and Selecting, Navigating of Menus, Kinds of Graphical Menus .Windows Interface: Windows characteristic, Components of Window, Windows Presentation Styles, Types of Windows, Window Management, Web systems.

Unit – V

Device and Screen-Based Control: Device based controls, Operable Controls, Text entry/read-only Controls, Section Controls, Combining Entry/Selection Controls, Other Operable Controls and Presentation Controls, Selecting proper controls.

Text Books:

1. The Essential Guide to User Interface Design, Wilbert O. Galitz, Wiley India Edition.
2. Sharps Interaction Design, Prece, Rogers, Wiley India.
3. Designing the user interfaces, Ben Shneidermann, 3rd Edition, Pearson Education Asia.

Reference Books:

1. User Interface Design, Soren Lauesen, Pearson Education.
2. Essentials of Interaction Design, Alan Cooper, Robert Riemann, David Cronin Wiley.
3. Human Computer Interaction, Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg Pearson Education.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc18_cs23
2. <https://www.scribd.com/interest/Human-Computer-Interaction/docs>
3. <https://www.interaction-design.org/courses/human-computer-interaction>

SOFTWARE PROJECT MANAGEMENT
(Professional Elective-I)
Common to CSE&IT

VSemester
Course Code: 201CS5E03

L T P C
3 0 0 3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain Software Project Management fundamentals and Planning activities
- CO2:** Compare SDLC models in project framework.
- CO3:** Demonstrate various Processes and Architectures of Software.
- CO4:** Explain the concepts of Iterative Project Planning, Organizations and Responsibilities.
- CO5:** Discuss Project Monitoring Control and Resource Allocation.
- CO6:** Apply various Effort estimation techniques and tools in real time applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	1	-	-	-	-	-	-	-
CO2	2	3	1	-	2	-	-	-	-	-	-	-
CO3	1	1	3	-	1	-	-	-	-	-	-	-
CO4	1	-	3	-	-	-	-	-	-	-	-	-
CO5	1	3	1	-	1	-	-	-	-	-	-	-
CO6	2	1	1	-	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	-	1
CO3	2	-
CO4	2	-
CO5	-	2
CO6	-	1

Unit - I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

Unit - II

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

Unit - III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

Unit – IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Unit – V

Effective Feedback Guidance and Assistance: Providing the Proper Feedback, Guidance and Assistance
Effective Internationalization and Accessibility.

Text Books:

1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1. Software Project Management, Joel Henry, Pearson Education.
2. Software Project Management in practice, Pankaj Jalote, Pearson Education.
3. Effective Software Project Management, Robert K. Wysocki, Wiley.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc18_mg08/preview.
2. <https://www.coursera.org/specializations/product-management>
3. https://www.tutorialspoint.com/software_engineering/software_project_management.
4. <https://www.scribd.com/doc/7102316/Software-Project-Management>.
5. <https://in.udacity.com/course/software-development-process--ud805>

ADVANCED UNIX PROGRAMMING
(Professional Elective-I)
Common to CSE&IT

VSemester
Course Code: 201CS5E04

L T P C
 3 0 0 3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Describe UNIX Operating System Architecture and Command Structure
- CO2:** Develop Shell Script using Shell commands.
- CO3:** Apply GREP and EGREP Commands with wild card and regular expressions to perform Data Manipulation Tasks.
- CO4:** Apply System Calls for file management and Directory Management.
- CO5:** Discuss about various system calls of Process control and signals
- CO6:** Illustrate various system calls of Shared Memory and semaphores.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	3	-	-	-	-	-	-	-
CO2	2	2	-	-	3	-	-	-	-	-	-	-
CO3	3	2	-	-	2	-	-	-	-	-	-	2
CO4	2	3	-	-	2	-	-	-	-	-	-	2
CO5	2	2	-	-	3	-	-	-	-	-	-	2
CO6	2	2	-	-	3	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit - I

Introduction: Architecture of Unix, Responsibilities of shell, Unix file system, vi editor. Unix commands: Some Basic Commands, file utilities, process utilities, text processing utilities, network utilities, disk utilities, Security by file permissions.

Unit - II

Shell Programming: Introduction, Shell variables, Meta character, I/O redirection, The Export command, The Profile File a Script Run During starting, The First Shell Script, The read command, Positional Parameters, The \$? Variable, The Exit command, Branching Control Structures, Loop Control Structures, The Continue and Break Statement- Real Arithmetic in Shell Programs: The here Document (<<)-The Sleep Command- Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Unit – III

Filters: The Grep Family-Other Filters- Regular expressions: Atoms, operators. The Stream Editor Sed.
AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in AWK, Applications, AWK and GREP.

Unit – IV

File Management: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat. Directories- Creating, removing and changing Directories, opendir, readdir, closedir, mkdir, rmdir, umask.

Unit – V

Process Control: Process identifiers, fork(), vfork(), wait() and exec() system calls

Signals: signal handling using signal function, kill and raise, alarm, pause, abort and sleep functions.

Shared memory-system calls of shared memory, semaphore structure in kernel, client server example.

Text Books:

1. Unix Shell Programming, M.G.Venkateshmurthy, Pearson.
2. Unix the ultimate guide, 3rd edition, Sumitabha Das, TMH.
3. Advanced programming in the unix environment by W. Richard Stevens.
4. Unix network programming by W. Richard Stevens.

Reference Books:

1. The Unix programming Environment, Brian W. Kernighan & Rob Pike, Pearson.
2. Unix and shell programming by B.M. Harwani, OXFORD university press.

Web Links:

1. <https://nptel.ac.in/courses/117106113>
2. <http://www.learnshell.com>
3. <http://www.tutorialspoint.com/unix/>
4. <https://www.youtube.com/watch?v=yCTnihfbPCo>
5. <https://www.geeksforgeeks.org/semaphores-in-process-synchronization/>
6. https://www.tutorialspoint.com/inter_process_communication/

BASIC CONCRETE TECHNOLOGY
(Open Elective-I)

V Semester
Course Code: 201CE5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Demonstrate the basic concepts of concrete.
- CO2: Illustrate the importance of quality of concrete
- CO3: Discuss the basic ingredients role in the production of concrete.
- CO4: Classify the fresh and the hardened concrete properties.
- CO5: Design the concrete mix by BIS method.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Ingredients of Concrete cements & Admixtures

Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume.

Aggregates Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water.

Unit - II

Fresh Concrete

Steps in Manufacture of Concrete – proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete – Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Concrete.

Unit – III

Hardened Concrete

Water / Cement ratio – Abram's Law – Gel space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT. Anti washout concrete.

Unit – IV

Elasticity, Creep & Shrinkage

Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete, Factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage – types of shrinkage.

Mix Design Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design

Unit – V

Special Concretes

Ready mixed concrete, Shotcrete, Light weight aggregate concrete, Cellular concrete, No- fines concrete, High density concrete, Fiber reinforced concrete, Different types of fibers, Factors affecting properties of F.R.C, Polymer concrete, Types of Polymer concrete, Properties of polymer concrete, High performance concrete – Self consolidating concrete, SIFCON, self-healing concrete, Recycled concrete

Text Books:

1. Concrete Technology: Theory and Practice, M.L. Gambhir, McGraw Hill, 5th Edition, 2017.
2. Concrete Technology, M.S. Shetty, Chand Publication, 2006
3. Concrete: Microstructure, Properties and Materials, Kumar Mehta and Paulo J.M. Monteiro, McGraw Hill, 2017.

Reference Books:

1. Concrete Technology, A.M. Neville and J.J. Brooks, Pearson, 2019.
2. Concrete Technology, A.R. Santhakumar, Oxford, 2018.
3. Properties of Concrete, A.M. Neville, Pearson, 2011
4. Concrete, S. Mindess and J.F. Young, Prentice-Hall, 2008

Web Links:

1. <https://nptel.ac.in/courses/105102012>
2. [www.brighthubengineering.com › Concrete Technology](http://www.brighthubengineering.com/concrete-technology/)
3. <https://www.materialsworldmodules.org/index.php/.../web-links-sumitted-by-members>
4. <https://www.fhwa.dot.gov/resourcecenter/teams/construction/links.cfm>
5. www.almahroos.com/index.php/fr/component/tags/tag/17-concrete-technology

WASTE WATER MANAGEMENT (Open Elective-I)

V Semester
Course Code:201CE5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the importance of sanitation and wastewater management.
- CO2: Explain the various methods of sewage flow estimation and pumping systems.
- CO3: Identify the various characteristics of sewage and the treatment system.
- CO4: Outline the various secondary treatment technologies for waste water
- CO5: Explain the different tertiary and effluent disposal methods.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction:

Introduction to sanitation–systems of sanitation–relative merits and demerits –need for waste water management–basic terminology in waste water–generation of waste water– types – collection and conveyance of waste water– classification of sewerage systems.

Unit – II

Sewage Flow and Pumping:

Estimation of sewage flow and storm water drainage–fluctuations. Types of sewers– hydraulics of sewers– appurtenances in sewerage. Pumping of waste water:pumping stations–location–components– typesofpumpsand their suitability with regards to waste waters.

Unit – III

Sewage Analysis and Treatment Sewage characteristics-sampling and analysis of waste water– physical, chemical ,and biological examination– measurement of BOD, COD. Preliminaryandprimarytreatment–screens–gritchambers–greasetraps–floatation– sedimentation.

Unit – IV

Secondary Treatment: Aerobic and anaerobic treatment process-comparison. Aerobicunits:Activated sludge process,principles,modificationsof activated sludge processes–Oxidationponds– Trickling filters–Rotating biological contactors. Anaerobic units: UASB Reactor, principle and working.

Unit – V

Tertiary Treatment and Disposal:

Removal of Nutrients–Nitrification and Denitrification–Ion exchange–membrane processes –MF, UF, NF, RO. Disposal of sewage–Methods of disposal–Effluent Standards. Need, Scope and demand for waste water recycling

Text Books:

1. Wastewater Engineering: Treatment and Resource Recovery, Metcalf & Eddy, 5th Edition, McGraw-Hill, New York, 2014.
2. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition, 2018.
3. Elements of Environmental Engineering, K.N. Duggal, S.Chand& Company Ltd. New Delhi, 2012.
4. Wastewater Treatment for pollution control and Reuse, Soli J Areivala, Sham R Asolekar, Mc-GrawHill, New Delhi, 2011.

Reference Books:

1. Environmental Engineering-II: Sewage disposal and Air pollution Engineering, Garg & S.K., Khanna Publications.
2. Environmental Engineering by D. Srinivasan, PHI Learning private Limited, New Delhi, 2011

Web Links:

1. https://web.iitd.ac.in/~arunku/files/CVL100_Y16/LecSep1220.pdf
2. <http://www.civil.iitm.ac.in/dwwm/sites/default/files/presentations>
3. https://www.researchgate.net/publication/221911472_Wastewater_Management

BASIC SURVEYING
(Open Elective-I)

V Semester
Course Code: 201CE5O03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the various fundamental principles Geodetics
- CO2: Explain the Measurement of Horizontal Distances.
- CO3: Describe the Measurement of Directions and Angles horizontal and vertical plane.
- CO4: Explain Plane Table Surveying
- CO5: Describe the compute areas and volumes and represent 3D data on plane figures as contours.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction:

Definition of surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy. Classification of maps, map scale, conventional symbols, topographic maps, map layout, Survey of India Map numbering systems.

Measurement of Horizontal Distances:

Measuring tape and types. Measurement using tapes, Taping on level ground and sloping ground. Errors and corrections in tape measurements, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle. Booking of tape survey work, Field book, entries, Conventional symbols, Obstacles in tape survey, Numerical problems.

Unit – II

Measurement of Directions and Angles:

Compass survey: Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems

Traversing:

Traverse Survey and Computations: Latitudes and departures, rectangular coordinates, Traverse adjustments, Bowditch rule and transit rule, Numerical Problems.

Unit – III

Leveling:

Basic terms and definitions, Methods of leveling, Dumpy level, auto level, digital and laser levels. Curvature and refraction corrections. Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling.

Unit – IV

Plane Table Surveying:

Plane table and accessories, Advantages and limitations of plane table survey, Orientation and methods of orientation, Methods of plotting – Radiation, Intersection, Traversing, Resection method, Two point and three point problems, Solution to two point problem by graphical method, Solution to three point problem Bessel's graphical method, Errors in plane table survey.

Unit – V

Areas and Volumes:

Measurement of area by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule, area from co-ordinates, introduction to planimeter, digital planimeter. Measurement of volumes- trapezoidal and prismoidal formula.

Contouring:Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.

Text Books:

1. B.C. Punmia, "Surveying Vol.1", Laxmi Publications pvt. Ltd., New Delhi –2017.
2. Kanetkar T P and S V Kulkarni , Surveying and Leveling Part I, Pune VidyarthiGrihaPrakashan,2015

Reference Books:

1. S.K. Duggal, "Surveying Vol.1", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2019.
2. K.R. Arora, "Surveying Vol. 1" Standard Book House, New Delhi. –2017
3. R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, NewDelhi
4. A. Bannister, S. Raymond , R. Baker, "Surveying", Pearson, 7th ed., NewDelhi

Web Links:

1. nptel.iitm.ac.in
2. <https://nptel.ac.in/courses/105/105/105105176/>
3. <https://nptel.ac.in/courses/105/101/105101083/>
4. <https://nptel.ac.in/courses/105/108/105108069/>

DC MACHINES AND TRANSFORMERS

(Open Elective-I)

V Semester
Course Code:201EE5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Explain the concepts of electromechanical energy conversion and construction of a DC machines.
- CO2** Analyze the performance of a DC generators.
- CO3** Analyze the ill-effect of armature reaction, commutation of DC machine and operation of DC motors.
- CO4** Explain the speed control of DC motors and testing of DC machines.
- CO5** Analyze the performance of single-phase transformers.
- CO6** Explain the connections of three phase transformers, Scott connection and tap changers.

Mapping of Course Outcomes with Program Outcomes:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO\PSO	PSO1	PSO2
CO1	-	1
CO2	1	1
CO3	-	1
CO4	-	1
CO5	1	2
CO6	1	2

Unit - I

Electromechanical Energy Conversion and introduction to DC machines: Principles of electromechanical energy conversion - singly excited and multi excited systems calculation of force and torque using the concept of co-energy. Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC shunt generator –applications of DC Generators

Unit – II

Operation of DC Motors: Choice of Motor - Type of Electric Drives - Starting And Running Characteristics – Speed Control–Temperature Rise – Applications of Electric Drives–Types of Industrial Loads–Continuous– Intermittent And Variable Loads–Load Equalization - Introduction To Energy Efficient Motors.

Unit – III

Speed Control of Motors and Testing of DC Machines & Single-phase Transformers: Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – field's test- separation of losses.

Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit.

Unit – IV

Performance And Testing of Transformers and Auto Transformers: Regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency. Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses – parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

Unit – V

Three Phase Transformers: Poly phase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages – three winding transformers- transients in switching –off load and on load tap changers Scott connection.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers, 7th edition, 2011
2. Electric Machinery by A. E. Fitzgerald, Charleskingsley, Stephen D. Umans, TMH, 6 th edition, 2003.

Reference Books:

1. Electrical Machines by D. P. Kothari, I. J. Nagarth, McGraw Hill Publications, 4 th edition, 2010.
2. Electrical Machines by R. K. Rajput, Lakshmi publications, 5th edition.
3. Electrical Machinery by Abijith Chakrabarti and Sudhipta Debnath, McGraw Hill, 1st edition.

Web Links:

1. <http://nptel.ac.in/courses/108106071>
2. http://www.ncert.nic.in/html/learning_basket/electricity/electricity/machine/machine_content.htm
3. <https://lecturenotes.in/subject/41/electrical-machine-1>.

ANALOG ELECTRONIC CIRCUITS
(Open Elective-I)

V Semester
Course Code: 201EE5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Interpret the characteristics of semiconductor diodes.
- CO2: Compare the characteristics of rectifiers with and without filters.
- CO3: Summarize the characteristics of BJT and FET in different configurations.
- CO4: Apply biasing methods for stabilization of BJT and FET amplifiers.
- CO5: Analyze small signal low frequency equivalent models of BJT and FET.
- CO6: Interpret the characteristics of special semiconductor diodes.

Mapping of Course Outcomes with Program Outcomes:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-
CO3	3	1	2	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO\PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
CO6	1	-

Unit - I

Review of Semi-Conductor Physics: Insulators, Semiconductors, and Metals classification using Energy Band Diagrams, Mobility and Conductivity, Electrons and holes in Intrinsic Semiconductors, Extrinsic Semiconductor, (P and N Type semiconductor) Hall effect, Generation and Recombination of Charges, Diffusion. Junction Diode Characteristics: Operation and characteristics of p-n junction diode. Current components in p-n diode, diode equation. Temperature dependence on V-I characteristic, diffusion capacitance and diode resistance (static and dynamic), energy band diagram of p-n diode.

Special Diodes: Avalanche and Zener break down, Zener characteristics. Light Emitting Diodes.

Unit - II

Rectifiers and Regulators: Half wave rectifier, ripple factor, full wave rectifier (with and without transformer), harmonic components in a rectifier circuit, Basic filters. Simple circuit of a regulator using Zener diode. Types of regulators-series and shunt voltage regulators, overload protection of voltage regulators. Clipper and Clamper circuits.

Unit – III

Transistors and FET: Junction transistor, transistor current components, transistor as an amplifier and switch. Characteristics of transistor (CE, CB and CC configurations). Transistor biasing and thermal stabilization (to fixed bias, collector to base bias, self bias). Basics of Field Effect Transistors - Enhancement and depletion mode transfer and drain characteristics.

Unit – IV

Feedback Amplifiers: Classification, feedback concept, transfer gain and general characteristics of negative feedback amplifiers, effect of feedback on input and output resistances. Methods of analysis of feedback amplifiers.

Unit – V

Power Amplifiers: Classification, push-pull amplifiers, Introduction to harmonics (distortion factor). Oscillators: Condition for oscillation, RC-phase shift oscillator. Wien bridge oscillator, Crystal oscillator. Frequency and amplitude stability of oscillator.

Text Books:

1. Electronic Devices and Circuits – J. Millman, C. C. Halkias, Tata Mc-Graw Hill.
2. Electronic Principles, Albert Paul Malvino, Tata McGraw Hill, 2002.
3. Jacob Millman and Arvind Grabel, "Microelectronics," Mc Graw hill, New York, 2008.
4. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.

Reference Books:

1. Microelectronic circuits: analysis and design ,3rd edition, Muhammad H.Rashid, cengage publications.
2. Electronic Devices and Circuits by David A. Bell, Oxford University Press.
3. Electronic Devices, Thomas Floyd, Prentice Hall of India, New Delhi, 2003.
4. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, Second Edition.

Web Links:

1. <http://nptel.iitm.ac.in/courses/>
2. <http://www.deas.harvard.edu/courses/es154/>
3. <http://nptel.ac.in/courses/117106101/>
4. <http://nptel.ac.in/courses/122106025/>

BASIC ELECTRICAL MEASUREMENTS (Open Elective-I)

V Semester
Course Code:201EE5O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Select the type of instrument for measurement of AC & DC voltage and current.
- CO2: Analyse the operation of wattmeter and energy meter.
- CO3: Differentiate the operation of AC and DC bridges.
- CO4: Describe the operation various Transducers.
- CO5: Explain the importance of Digital Meters and their working principles.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Analog Ammeter and Voltmeters: Classification – deflecting - control and damping torques – Construction of PMMC - Moving Iron and Electro dynamo instruments - Torque equation - Errors and Compensation – Numerical Problems.

Unit - II

Analog Wattmeters and Energy Meters: Electrodynamometer type wattmeter (LPF and UPF) - Induction Type Energy meters-Construction and working - Errors and Compensation– Numerical Problems

Unit - III

Measurements of Electrical parameters: DC Bridges: Measurement of Resistance – Kelvin's double bridge - Wheatstone bridge – Numerical Problems.

AC Bridges: Measurement of inductance and quality factor - Maxwell's bridge - measurement of capacitance - Schering Bridge– Numerical Problems.

Unit - IV

Transducers: Classification - Resistive (Strain Gauge) - Inductive (LVDT) and Capacitive (Piezo electric) Transducer – Numerical Problems.

Unit - V

Digital Meters: Successive approximation Digital Voltmeter — Digital frequency meter - Digital multimeter - Digital Energy Meter.

Text Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co.Publications - 19th revised edition - 2011.
2. Electronic Instrumentation by H.S.Kalsi - THM.

Reference Books:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition.

Web Links:

1. <https://www.youtube.com/watch?v=p5BfMdI3cwk>
2. <https://www.youtube.com/watch?v=-gcBVaCIKhE>
3. <https://www.youtube.com/watch?v=gDcruGcPqN0>

RENEWABLE ENERGY SOURCES
(Open Elective-I)

V Semester
Course Code:201ME5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the Environmental sustainability, design and development of Renewable Energy sources
- CO2: Identify the Grid integration issues in Wind Power plants
- CO3: Develop maximum power tracking techniques in Solar PV systems
- CO4: Explain the principle and working of Biomass and Geothermal Energy systems
- CO5: Explain basic principle and working of tidal energy systems
- CO6: Illustrate construction of fuel cell and its working

Mapping of Course Outcomes with Program Outcomes:

CO/PS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	-	-	-	3	-	-	-	-	-
CO2	3	2	1	-	-	-	3	-	-	-	-	-
CO3	2	1	-	-	-	-	3	-	-	-	-	-
CO4	1	-	-	-	-	-	3	-	-	-	-	-
CO5	2	3	2	2	-	-	3	-	-	-	-	-
CO6	3	-	-	-	-	-	3	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Renewable Energy (Re) Sources

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

Unit – II

Wind Energy

Power in the Wind – Types of Wind Power Plants (WPPs)–Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

Unit – III

Solar Pv And Thermal Systems

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell

concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications

Unit – IV

Biomass Energy

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system

Unit – V

Other Energy Sources

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

Text Books:

1. Joshua Earnest, Tore Wizeliu, ‘Wind Power Plants and Project Development’, PHI Learning Pvt.Ltd, New Delhi, 2011
2. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, USA, 2016

Reference Books:

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited,Delhi, 2015.
3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, 2011
4. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004

Web Links:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/103103308>

FUNDAMENTALS OF MECHANICAL ENGINEERING
(Open Elective-I)

V Semester
Course Code:201ME5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Compare the different types of boilers.
- CO2: Interpret different manufacturing methods.
- CO3: Explain the working of air compressors and the concept of refrigeration
- CO4: Illustrate the fundamental principles and applications of refrigerator.
- CO5: Explain the working principle of Internal Combustion Engines and their performance.
- CO6: Calculate the Power transmitted in Belts, Ropes and Gear drives

Mapping of Course Outcomes with Program Outcomes:

CO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	1	-	-	-	-	-	-	-	-	-	1
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-	-	-	1
CO6	3	1	-	-	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	1
CO2	-	1
CO3	-	1
CO4	-	1
CO5	-	1
CO6	-	1

Unit - I

Steam boilers:

Classification of boilers, essentialities of boilers, selection of different types of boilers, (Babcock and Wilcox, locomotive, lamont) study of boilers, boiler mountings and accessories.

Unit – II

Metal joining: arc welding, gas welding, brazing and soldering.

Metal forming: forging – operations, rolling and extrusion principles.

Machine tools: lathe classification, specifications, and operations.

Casting: Steps involved in making a casting – Advantages and applications. –Patterns and Pattern making

Unit – III

Reciprocating and rotary air compressors:

Uses of compressed air, types, working principle, work done, simple problems. Refrigeration: concepts, principle of refrigeration and types of refrigeration

Unit – IV

Internal combustion engines:

classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency

Unit – V

Power transmission devices:

Belt and ropes drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, centrifugal tension in a belt, power transmitted by belts and ropes, initial tensions in the belt, simple problems. Comparison of belt drives with gear drives

Text Books:

1. Mechanical Engineering Science K R Gopala Krishna, Subhas publications
2. Thermal Engineering, Ballaney, P. L. Khanna Publishers, 2003.
3. Elements of Mechanical Engineering, A. R. Asrani, S. M. Bhatt and P. K. Shah, B.S. Publications
4. Elements of Mechanical Engineering, M. L. Mathur, F. S. Metha & R. P. Tiwari Jain Brothers Publications.2009.

Reference Books:

1. Theory of Machines, S. S. Rattan, Tata McGraw Hil, 2004 & 2009.
2. Production Technology by P. N. Rao by I& II McGraw-Hill publications

Web Links:

1. <http://nptel.ac.in/courses/112107216/9>
2. <https://www.electrical4u.com/steam-boiler-working-principle-and-types-of-boiler/>
3. <http://www.nptelvideos.in/2012/12/manufacturing-processes-i.html>
4. <http://nptel.ac.in/courses/112105128/20>
5. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR /machine /ui/ Course _home-lect.htm

SUPPLY CHAIN MANAGEMENT

(Open Elective-I)

V Semester
Course Code:201ME5O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the framework and scope of supply chain network and functions.
- CO2: Relate the importance of the design of a supply chain as key components of an organization's strategic plan.
- CO3: Develop the strategic importance of logistics and supply chain relations.
- CO4: Summarize the creation of new value in the supply chain for sourcing, transporting, pricing.
- CO5: Develop various supply chain methods and information technology.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Role of Supply chain Management :Scope and Importance-Evolution of Supply Chain-Decision Phases in Supply Chain–Competitive and Supply chain Strategies Drivers of Supply Chain Performance and Obstacles.

Unit – II

Supply Chain Network Design: Role of Distribution in Supply Chain-Factors influencing Distribution network design – Design options for Distribution Network in Practice-Role of network Design in Supply Chain – Frame work for network Decisions

Unit – III

Logistics and Supply Chain Relationships: Bench marking the logistics process and SCM operations – Mapping the supply chain processes – Supplier and distributor benchmarking –setting bench marking priorities–identifying logistics performance indicators–Channel structure–Economics of distribution–channel relationships–logistics service alliances

Unit – IV

Sourcing, Transporting and Pricing Products: Sourcing decisions and Role of transportation in supply chain – factors affecting transportations decision -infrastructure suppliers of transport services – transportation economics and pricing – documentation -pricing and revenue management Lack of coordination and Bullwhip Effect - Impact of lack of coordination. - CRM–Internal supply chain management

Unit – V

Supply Chain and Information Technology: The role IT in supply chain-The supply chain IT frame work Customer Relationship Management – Internal supply chain management –supplier relationship

management-future of IT in supply chain–E-Business in supply chain

Text Books:

1. Sunil Chopra, Peter Meindl and Kalra, Supply Chain Management, Strategy, Planning, And Operation, Pearson Education, 2010
2. Bowersox Donald J, Logistical Management–The Integrated Supply Chain Process Tata Mc Graw Hill, 2000

Reference Books:

1. Jeremy F.Shapiro, Modeling the Supply Chain, Thomson Duxbury, 2002
2. Srinivasan G.S,Quantitative models in Operations and Supply Chain management, PHI, 2010
3. David J.Bloomberg , Stephen Lemay and JoeB.Hanna,Logistics, PHI 2002
4. D.K.Agrawal:“Distribution and Logistics Management”, Mac Millan Publishers, 2011

Web Links:

1. <http://www.cscmp.org/>
2. <http://www.manufacturing.net/scl/>
3. <http://www.informationweek.com/>

3D PRINTING
(Open Elective-I)

V Semester
Course Code:201ME5O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summarize the basics of Additive manufacturing (AM) technologies.
- CO2: Explain about vat photo polymerization, material jetting and binder jetting AM technologies.
- CO3: Explain material extrusion and sheet lamination AM technologies.
- CO4: Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies.
- CO5: Apply the AM techniques in different industries
- CO6: Develop the direct energy deposition of AM Technology.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	2	-	-	-	-	-	-	-
CO2	2	-	-	-	3	-	1	-	-	-	-	-
CO3	1	-	-	-	3	-	1	-	-	-	-	-
CO4	2	-	-	-	3	-	1	-	-	-	-	-
CO5	2	-	-	-	3	-	1	-	-	-	-	-
CO6	2	-	-	-	3	-	1	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
CO6	1	-

Unit - I

Introduction:

Basic principle of 3D printing (3DP), need and advantages of 3DP or additive manufacturing (AM), AM Process chain - CAD Model - Input file formats - Generation and Conversion of STL file - File Verification and Repair - Build File Creation - Part Construction - Part Cleaning and finishing, Classification of additive manufacturing processes-Baseline approach, Raw material-based approach and ASTM classification, Materials used in additive manufacturing, Challenges in Additive Manufacturing.

Unit - II

VAT Photo Polymerization, Material Jetting and Binder Jetting AM technologies: Stereolithography Apparatus(SLA), ,Solid Ground Curing(SGC) , CMET's Solid Object Ultraviolet-Laser Printer (SOUP),- Working Principle, Materials, Models and specifications, Applications, Advantages and Disadvantages

Unit - III

Material Extrusion and Sheet Lamination AM technologies: Fused Deposition Modelling (FDM),Laminated Object Manufacturing (LOM), 3D Systems' Multi-Jet Modeling System (MJM), Working principle, Materials, Models and specifications Applications, Advantages and Disadvantages.

Unit – IV

Powder Bed Fusion and Direct Energy Deposition: Selective Laser Sintering (SLS), Direct Metal Laser Sintering(DMLS), Electron Beam Melting(EBM), Laser Engineered Net Shaping(LENS),Wire Arc Additive Manufacturing(WAAM)-Working principle, Materials, Applications, Advantages and Disadvantages.

Unit – V

Additive Manufacturing -Applications:

Applications in Design, Applications in Engineering, Analysis and Planning, Applications in Manufacturing and Tooling, Aerospace Industry, Automotive Industry, Biomedical Industry, Jewelry Industry, Coin Industry, sports, electronics, food, construction and architectural, Case studies

Text Books:

1. Additive Manufacturing Technologies:3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Ian Gibson, David W.Rosen, Brent Stucker, Springer, 2nd Edition
2. 3D Printing and Additive Manufacturing: Principles and Applications, Chua C.K.,and LeongK.F.,World Scientific publications, 4th Edition

Reference Books:

1. Additive Manufacturing: Principles, Technologies and Applications, C.P Paul, A.N Junoop, McGrawHill, 2021
2. Additive Manufacturing, Second Edition, Amit Bandyopadhyay Susmita Bose, CRC Press Taylor & Francis Group, 2020
3. 3D Printing Technology Fundamentals and Applications Prof H N Pandya 2021
4. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006

Web Links:

1. <https://www.nist.gov/additive-manufacturing>
2. <https://www.metal-am.com/>
3. <http://additivemanufacturing.com/basics/>
4. <https://www.3dprintingindustry.com/>
5. <https://www.thingiverse.com/>

ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION
(Open Elective-I)

V Semester
Course Code:201ME5O05

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the concepts , types and development of entrepreneurship development
- CO2: Apply the business plan for preparation and evaluation of project.
- CO3: Summarize about Institutional Support to Entrepreneur and MSMEs
- CO4: Illustrate the Opportunities of Entrepreneurship Internationally.
- CO5: Demonstrate Informal Risk Capital, Venture capital & Social responsibility for entrepreneurship

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Entrepreneur &Entrepreneurship:

Entrepreneur &Entrepreneurship: Meaning of entrepreneur - Evolution of the concept - Functions of an Entrepreneur - Types of Entrepreneur - Intrapreneur- an emerging class - Concept of Entrepreneurship - Evolution of Entrepreneurship - Development of Entrepreneurship - Entrepreneurial Culture - Stages in entrepreneurial process.

Unit – II

Business Planning Process:

Meaning of business plan - Business plan process - Advantages of business planning - Marketing plan - Production/operations plan - Organization plan - Financial plan - Final Project Report with Feasibility Study - preparing a model project report for starting a new venture.

Unit – III

Institutions supporting Entrepreneurs

Small industry financing institutions in developing countries - A brief overview of financial institutions in India - Central level and state level institutions - SIDBI - NABARD - IDBI - SIDCO - Indian Institute of Entrepreneurship - DIC - Single Window - Latest Industrial Policy of Government of India.

Unit – IV

International Entrepreneurship Opportunities:

The nature of international entrepreneurship - Importance of international business to the firm - International versus domestic entrepreneurship - Stages of economic development - Entrepreneurship entry into international business - exporting - Direct foreign investment - barriers to international trade.

Unit – V

Informal Risk Capital and Venture Capital:

Informal risk capital market - venture capital - nature and overview - venture capital process - locating venture capitalists - approaching venture capitalists. Social Entrepreneurship: Social enterprise-need - types - characteristics and benefits of social enterprises-Social entrepreneurship - Rural entrepreneurship, MSME Policies. Make-In India, Start-Up India, Stand-Up India.

Text Books:

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012
2. VSP Rao, Kuratko: "Entrepreneurship", Cengage Learning, New Delhi, 2011.
3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012.

Reference Books:

1. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011.
2. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi, 2012
3. P.C.Shekhar: "Entrepreneurship Development", Everest Publishing House, New Delhi, 2011.
4. R.H. Hisrich, M.P. Peters and D.A. Shepherd: "Entrepreneurship" Mc Graw Hill Irwin, 8 th Edition,2010.
5. Ryszard Praszkier& Andrzej Nowak: "Social Entrepreneurship: Theory and Practice Paperback – Illustrated", Cambridge University Press, New York-February 2, 2012.

Web Links:

1. <http://nptel.ac.in/courses>
2. <https://www.tutorialspoint.com>
3. www.tutorialspoint.com

AUTOMOBILE ENGINEERING
(Open Elective-I)

V Semester
Course Code:201ME5O06

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summarize the Vehicle Chassis Layouts of 4-wheelers and Motor Vehicle Act.
- CO2: Identify the different constructional features and working principles of Un-Sprung components of the given vehicle
- CO3: Identify the different constructional features and working principles Sprung components of the given vehicle.
- CO4: Summarize the functionalities of various Electrical systems of typical Automobile
- CO5: Explain the different Active Vehicle Safety Systems.
- CO6: Explain the different Passive Vehicle Safety Systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	-	-	-	-	-	-	-	-	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-
CO3	3	1	1	-	-	-	-	-	-	-	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	-
CO5	3	1	1	-	-	-	-	-	-	-	-	-
CO6	3	1	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	3	-
CO2	3	-
CO3	3	-
CO4	3	-
CO5	3	-
CO6	3	-

Unit - I

Introduction:

Components of four wheeler automobile – chassis and body –Chassis Layout - power transmission – rear wheel drive, front wheel drive, 4 wheel drive and Introduction to Motor Vehicle Act 1988 – Homologation of Vehicles.Front Axle; Types of Front axles: Elliot; Reverse Elliot; Lamoine; and Reversed Lamoine; Stub axle.

Unit – II

Transmission System:

Clutches, principle, types, gear boxes, types, Propeller shaft –Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles– types.

Steering System: Steering geometry – camber, castor, king pin rake, combined angle, toe-in, toe-out center point steering. Types of steering mechanism –Ackerman steering mechanism, Davis steering mechanism, steering linkages

Unit – III

Suspension System:

Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system, Air Suspension, Rubber Suspension, Hydrolastic suspension system, Hydragas suspension system,

Braking System:

Mechanical braking system, hydraulic braking system requirement of brake fluid, pneumatic and vacuum brakes, Parking Braking system.

Unit – IV

Wheels And Tyres:

Basic Requirements of Wheels and Tyres, Construction of Wheel Assembly, Tyre Construction, Types, Tyre Sizes and Designation, Aspect Ratio, Tyre Tread Pattern, Selection of Tyre under Different Applications.

Unit – V

Electrical System:

Charging circuit, generator, starting system, lighting, horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator.

Safety Systems:

Introduction, safety systems - seat belt, air bags, bumper, anti-lock brake system (ABS), Electronic Brake force Distribution (EBD), mirrors, central locking, speed control, Retractable Steering system, Head restraints, seats with anti-submarine effects and fuel cut off switch.

Text Books:

1. Automobile Engineering: Vol. 1. Dr. Kirpal Singh, Standard Publishers, 13th Edition, 2020
2. Automotive Mechanics, William H Crouse, TMH Distributors, 10th Edition

Reference Books:

1. Advanced vehicle Technology, by Heinz Heisher, 2nd Edition, BH Pub.
2. Automotive Chassis by Jonsen Reimpell, 2nd Edition, BH Pub
3. Automobile Electrical & Electronics by Tom Denton, 5th Edition, Routledge Pub.
4. The Motor Vehicle Act, 1988, Bare Act with Amendments, 2020 Edition, Law Literature Pub

Web Links:

1. <https://nptel.ac.in/courses/107/106/107106088/>
2. <https://www.sciencedirect.com/science/book/9780750650540>

PRINCIPLES OF SIGNALS & SYSTEMS
(Open Elective-I)

V Semester
Course Code:201EC5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Outline the signal representation using fourier series.
- CO2** Interpret the signals in frequency domain using fourier transform.
- CO3** Infer LTI system characteristics.
- CO4** Compare sampling methods
- CO5** Apply Z-transform techniques for the analysis of discrete-time signals and Systems.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Signals: Classification of Signals, Different deterministic signals: impulse, step, ramp, gate, signum, sinc, sinusoidal, exponential, complex exponential, operations on signals. Fourier Series: Representation of Fourier series for continuous time periodic signals, Trigonometric Fourier series and Exponential Fourier series.

Unit – II

Fourier Transform: Deriving Fourier Transform (FT) from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function, Applications of Fourier Transforms

Unit – III

Signal Transmission Through LTI Systems: Classification of Systems, Impulse response and step response of LTI systems, Transfer function of a LTI system. Filter characteristics of LTI systems. Distortion less transmission through a system, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Signal bandwidth, system bandwidth.

Unit – IV

Sampling: Sampling, Sampling theorem – Graphical and analytical proof for BandLimited Signals, Nyquist rate, Nyquist duration, Impulse sampling, Natural sampling and Flat top Sampling, Reconstruction of signal from its samples, Effect of undersampling – Aliasing,

Unit – V

Z–Transforms: Z-Transform of a discrete time signal, Distinction between Laplace, Fourier and Z-transforms, Region of convergence in Z-Transform, constraints on ROC for various classes of discrete signals, Properties of Z-transforms, Inverse Z-transform.

Text Books:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky, and S.H. Nawab, PHI, 2nd Edition, 2016.
2. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
3. Signals and Systems – A. Anand Kumar, PHI, 4th Edition, 2017.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition

Web Links:

1. <https://freevideolectures.com/course/3540/signals-and-systems-i>(Signals and Systems I by Prof. K.S. Venktesh IIT Kanpur)
2. <https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/>
3. <https://nptel.ac.in/courses/108104100>(Principles of Signals and Systems, Video course, Coordinator by Prof. Aditya, K. Jagannatham,IIT Kanpur)

INTRODUCTION TO INTERNET OF THINGS (Open Elective-I)

V Semester
Course Code:201EC5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO 1: Interpret the evolution of different internet technologies and need for IOT.
- CO 2: Identify different networking components in IOT with respect to OSI.
- CO 3: Infer the need of sensors and actuators used in IOT.
- CO 4: Outline the terminologies and technologies associated with IOT connectivity.
- CO 5: Summarize IOT applications for societal needs.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to IOT: Introduction, Evolution of IOT, IOT and M2M, IOT -CPS, IOT-WoT, Various enablers of IOT and Complex interdependencetechnologies, Networking components of IOT.

Unit – II

NetworkingComponentsinIOT:Introduction,Networktypes,Networkreachability,OSImodel, InternetProtocolsuite,Datalinklayeraddressing, Networklayeraddressing,TCP/IPtransport layer.

Unit – III

IOTsensorsandactuators:Introduction,Sensorsanditscharacteristics,typesofsensing,sensing considerations,Actuators, characteristicsofactuators, types ofactuators.

Unit – IV

IOT software and Protocols: Introduction, dataprotocols, MQTT, MQTT-SN, CoAP, XMPP, HTTP, Web Socket, Identification protocols, EPC, u Code.

Unit – V

Connectivity Technologies in IOT: Introduction, IEEE 802 15 4, Zigbee, Communication topologies in Zigbee, WirelessHART network architecture, RFID, Lora, WI-Fi, Bluetooth.

IOT Applications: IOT in agriculture, Smart irrigation Management system, IOT in health care systems.

Text Books:

1. Internet of Things- AHands-onApproach, Arshdeep Bahgaand Vijay Madisetti, Universities Press, 2015, ISBN:9788173719547
2. Getting Started with RaspberryPi, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN:9789350239759.
3. Misra,S.,Mukherjee,A.,&Roy,A.(2021).Introduction to IoT. Cambridge:Cambridge University Press. doi:10.1017/9781108913560.

Reference Books:

1. Adrian McEwen, Hakim Cassimally “Designing the Internet of Things”, John Wiley & Sons, 2014.
2. Peter Friess,’ Internet of Things—From Research and Innovation to Market Deployment’, River Publishers, 2014

Web Links:

1. <https://onlinecourses.nptel.ac.in/noc2lee85/course>
2. <https://onlinecourses.nptel.ac.in/noc2lcs17/preview>
3. <https://nptel.ac.in/courses/106/105/106105166/>

SWITCHING THEORY AND LOGIC DESIGN
(Open Elective-I)

V Semester
 Course Code: 201EC5O03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Interpret number representation in different code formats.
- CO2** Illustrate the functionality of logic gates
- CO3** Realize logic minimization using suitable techniques.
- CO4** Construct combinational logic circuits for desired functionality.
- CO5** Realize boolean functions using PLDs.
- CO6** Interpret the functionality of filpflops.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-
CO5	2	3	2	-	-	-	-	-	-	-	-	-
CO6	2	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Number Systems: Representation of numbers of different radix, conversion from one radix to another radix, r-1's compliments and r's compliments of signed numbers, problem solving.

Binary Codes: 4 bit codes, BCD, Excess-3, 2421, 84-2-1 9's compliment code etc. Error detection & correction codes, Gray code, error detection, error correction codes.

Logic Gates: Basic logic operations: NOT, OR, AND, Universal building blocks, EXOR, EX-NOR Gates.

Unit – II

Boolean Algebra &Minimization Techniques: Boolean theorems, principle of complementation & duality, De-Morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 4 variables, tabular minimization.

Unit – III

Combinational Logic Circuits: Design of Half adder, full adder, half sub-tractor, full sub-tractor, applications of full adders, 4-bit binary adder-sub-tractor circuit, BCD adder circuit, look-a-head adder circuit, Design of decoder, de-multiplexer, 7 segment decoder, higher order de-multiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders & multiplexers.

Unit – IV

Programmable Logic Devices: Introduction to PLD's: PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

Unit – V

Sequential Circuits: Classification of sequential circuits (synchronous and asynchronous) basic flip-flops, truth tables and excitation tables (NAND RS latch, NOR RS latch, RS flip-flop, JK flip-flop, T-flip-flop, D-flip-flop with reset and clear terminals). Conversion from one flip-flop to another flip-flop.

Text Books:

1. Digital Design, Morris Mano, Pearson, 3rd Edition, 2002.
2. Fundamentals of Logic Design, Charles H. Roth Jr., Jaico Publishers, 2004.
3. Switching Theory and Logic Design, A. Anand Kumar, Pearson, 3rd Edition, 2013.

Reference Books:

1. Modern Digital Electronics, RP Jain, Tata Mc Graw Hill, 4th Edition, 2010.
2. Introduction to Switching Theory and Logic Design, Fredriac J. Hill, Gerald R. Peterson, 3rd Edition, John Wiley & Sons Inc., 1982.
3. Switching and Finite Automata Theory, ZviKohavi&NirajK.Jha, 3rd Edition 2010.

Web Links:

1. <http://nptel.ac.in/courses/117/106/117106086/> (By Prof. GoutamSaha, Electronics & Electrical Communication Engineering Dept, IIT Kharagpur).
2. <https://www.nptelvideos.in/2012/12/digital-circuits-and-systems.html>(By Prof. SantanuChattopadhyay, Electronics & Electrical Communication Engineering Dept, IIT Kharagpur).
3. <https://www.smartzworld.com/notes/switching-theory-and-logic-design-stld/>.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Open Elective-I)

V Semester
 Course Code: 201CS5O01

L T P C
 3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Apply object oriented programming features and concepts for solving given problem.
- CO2: Solve real time problems using the concepts of class, inheritance, interface and packages
- CO3: Test for runtime exceptions arise in java applications.
- CO4: Develop real time applications using multithreading
- CO5: Build java applications that interact with database for performing data related operations.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to Java: History of Java, Java Features, Program Structure, Command Line Arguments, User Input to Programs. Building Blocks of Java: Identifiers, Data types, Literal Constants, Variables and its Scope, Formatted Output with printf() Method, Operators, Precedence and Associativity of Operators, Type Casting. Control Statements: Selection Statements: if-else, switch, Iteration Statements: while, do-while, for, for each, Transfer Statements: Break, Continue

Unit – II

Arrays: Introduction, Declaration and Initialization of Arrays, Accessing Elements of Array. Operations on Array Elements, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Multi-dimensional arrays. Classes, Objects and Methods: Class Declaration, Creating Objects, Assigning One Object to Another, Methods, Constructors, this keyword, static keyword, final keyword, garbage collector, Access Control, Method Overloading, Constructor Overloading, Parameter Passing, Nested Classes. String Handling: StringClass, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Searching Strings, Methods for Modifying Strings, String Buffer Class and its methods, Class String Builder.

Unit – III

Inheritance: Inheritance, Types of Inheritance, Constructor Method and Inheritance, Super keyword, Method Overriding, Dynamic Method Dispatch, Inhibiting Inheritance of Class Using Final, Abstract Classes. Interfaces- Defining an interface, Implementing interfaces through classes, Multiple inheritance through interfaces.

Unit – IV

Packages: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Specifiers, java.lang package, Wrapper Classes. Exception Handling: Introduction, Importance of try, catch, throw, throws and finally block, Multiple Catch Clauses, Rethrowing Exception, Nested try and catch Blocks, Unchecked Exceptions, Checked Exceptions, Custom Exceptions.

Unit – V

Multithreading: Introduction, Thread Life Cycle, Creation of Threads, Thread Priorities, Thread Synchronization, Inter-thread Communication- Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application.

Text Books:

1. The Complete Reference Java, Herbert Schildt, 8th Edition, TMH, 2014.
2. Java one step ahead, Anita seth, B.L.Juneja, First Edition, Oxford, 2017.

Reference Books:

1. Introduction to java programming, by Y Daniel Liang, Seventh Edition, Pearson, 2017.
2. Core Java: An Integrated Approach, R.Nageswara Rao, Dream tech press, 2008.
3. Thinking in Java – Bruce Eckel, Fourth Edition, Prentice Hall, 2002.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. <http://java.sun.com/docs/books/tutorial/>
3. <http://www.tutorialspoint.com/java>
4. <http://www.javatpoint.com>
5. <http://www.w3schools.com/java>

DATA BASE MANAGEMENT SYSTEMS
(Open Elective-I)

V Semester
Course Code: 201CS5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summarize the database characteristics and identify various database architectures.
- CO2: Interpret relational database using SQL
- CO3: Examine issues in data storage and query processing for appropriate
- CO4: Make use of normalization techniques for database design
- CO5: Illustrate the mechanisms of transaction management.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Unit – II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance

Unit – III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Unit – IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

Unit – V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2. Database System Concepts, 5/e, Silberschatz, Korth, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. <https://www.geeksforgeeks.org/introduction-to-nosql/>
3. <https://www.youtube.com/watch?v=wkOD6mbXc2M>
4. <https://beginnersbook.com/2015/05/normalization-in-database-management-systems/>

COMPUTER ORGANIZATION

(Open Elective-I)

V Semester
Course Code:201IT5O01

L T P C
3 0 0 3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1: Describe the basic structure of a computer system, various number systems and arithmetic operations.
- CO2: Explain the Operation of CPUs including RTL, ALU, Instruction Cycle and Buses
- CO3: Demonstrate the architecture and functionality of central processing unit
- CO4: Illustrate the I/O and memory organization in an efficient way.
- CO5: Make use of multi processors and pipelining to improve the efficiency of computer system.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	-	-	-	-	-	-	-	-
CO2	3	1	1	2	-	-	-	-	-	-	-	-
CO3	2	2	2	3	-	-	-	-	-	-	-	-
CO4	2	1	3	2	-	-	-	-	-	-	-	-
CO5	2	3	1	1	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit – I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures. Data Representation: Data types, Complements, Fixed Point Representation. Floating – Point Representation. Other Binary Codes, Error Detection Codes. Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

Unit – II

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input – Output and Interrupt, Complete Computer Description,

Unit – III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer. Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

Unit – IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

Unit – V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGraw Hill, 2002.

Reference Books:

1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105163/>
2. <https://nptel.ac.in/courses/106/106/106106092/>
3. <https://www.udemy.com/course/computer-architecture-computer-organization-course/>
4. <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>

COMPUTER GRAPHICS
(Open Elective-I)

V Semester
Course Code:201IT5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identify the applications of computer graphics and video display devices for implementing graphical user interface.
- CO2: Analyse output primitives and filled area primitives in implementing various algorithms.
- CO3: Make use of geometric transformations , viewing and clipping in 2D and 3D graphics.
- CO4: Illustrate the various Visible Surface detection methods in 3D graphics.
- CO5: Apply OpenGL for general computer animations.
- CO6: Analyse different object and color modelling techniques, fractals and ray tracing classifications.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	1	3	1	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	2	1	2	-	3	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction: Applications of Computer Graphics, Video Display Devices-CRT, Raster-Scan and Random-Scan systems. graphics monitors and work stations and input devices Output Primitives: Line Drawing Algorithms- Bresenham's and DDA Line Drawing Algorithms, Mid-point circle and Ellipse algorithms. Filled Area Primitives: Scan Line Polygon fill algorithm, Boundary fill and Flood fill algorithms

Unit – II

2-D Geometrical Transformations: Translation, rotation, scaling, reflection and shear transformations.
2-D viewing: The viewing pipeline, Window to viewport coordinate transformation.
2-D Clipping: Cohen-Sutherland line clipping algorithm, Sutherland-Hodgeman polygon clipping algorithm and other clipping models: Text & Curve clipping models.

Unit – III

3-D Geometrical Transformations: Translation, rotation, scaling, reflection and shear transformations, 3-D Viewing pipeline.Concepts: Parallel and perspective projections and visible surface detection methods.

Unit – IV

Animations: General computer animation, Raster, Key-frame. Color models: RGB, YIQ, CMY, HSV. Graphics programming using OPENGL: basic graphics primitives-Generating three dimensional objects.

Unit – V

Fractals: Fractals and self similarity, Mandelbrot sets- Julia sets – Random Fractals. Overview of Ray Tracing: Intersecting rays with other primitives-Adding surface texture-Reflections and transparency-Boolean operations on objects.

Text Books:

1. Computer Graphics C Version, Donald D. Hearn, M. Pauline Baker, 2nd Edition, Pearson.
2. Computer Graphics using OPENGL, Stephen M. Kelley, Francis S. Hill, 2nd Edition, Pearson.

Reference Books:

1. Computer Graphics- Principles and practices in C, James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, 2nd Edition, Pearson Education, 2007.
2. Computer Graphics, Samit Bhattacharya, OXFORD Higher Education.
3. Computer Graphics, Peter, Shirley, CENGAGE.
4. Principles of Interactive Computer Graphics, Neuman, Sproul, TMH.
5. The Computer Graphics manual, Vol 2, David, Solomon, Springer.

Web Links:

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837computer-graphics-fall-2012/>
2. <http://nptel.ac.in/courses/106106090/>
3. <https://in.udacity.com/course/interactive-3d-graphics--s291>
4. http://www.cse.iitm.ac.in/~vplab/computer_graphics.html
5. <http://www.graphics.cornell.edu/online/links.html>

FUNDAMENTALS OF PETROLEUM INDUSTRY
(Open Elective-I)

V Semester
Course Code:201PT5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Apply the basic Principles and Mechanisms that are responsible for Petroleum Industry
- CO2: Analyze various modifications to equipment and designs and lithological characteristics and behaviour of reservoir
- CO3: Explain the hydrocarbon activity in reservoir, logging, testing and completions
- CO4: Analyze various case studies available in petrochemical, chemical, bioprocesses treatment of wastage.
- CO5: Explain various modification to well for Better production rate

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

The history of production: Oil beginning- A case for casing- More fire works-Underground mysteries- Breathing of the earth- Crisis and reservoir engineering- Horizontal drilling- The great offshore-Indian scenario.

Unit - II

The reservoir: Origin- Transformation- Characterization- Discovery. What's in the container? The prize: Determinants- The contents- The chemistry- Composition- Properties Impurities- Fingerprints- The origin of hydrocarbons. Drilling: The spring pole- Cable tool drilling and operations- Rotary drilling- Rig components- Drilling mud- Blowout preventers- Drilling offshore- Top drives and automation- The course- Location

Unit - III

Logging, testing and completing: Logging- Correlation logs- Real time- Directional and horizontal wells- Original hydrocarbons in place- Open hole testing- Completions- Cased hole logging and measuring devices. Hydrocarbon activity in the reservoir: Phases- Phases diagrams- Reservoir fluid categories- Using phase diagrams- Gas wells Vs oil wells- Shrinkage – Solution gas- oil ratio- Relative permeability. Production: The motivating force- Drive mechanisms- Producing phases- Primary production- Secondary recovery- Pressure maintenance and waterflooding- Tertiary recovery.

Unit – IV

Making it marketable: Field processing: Gas treating- Oil treating- Water disposal- Testing- Measurement and metering- Storage.

Unit – V

Remedial operations and workovers: Decision making- Workover rigs- Coiled tubing- Subsea completions- Well problems and stimulation- Changing production intervals.

Text Books:

1. Oil and Gas Production in Nontechnical Language, Martin S. Raymond & William L. Leffler, Penn Well Corporation, 2006.

Reference Books:

1. Introduction to Oil and Gas Production, American Petroleum Institute, 5th Edition, 1996.
2. Oil and Gas Production Hand Book: An Introduction Oil and Gas Production, Havard Devold, ABB ATPA Oil and Gas, 2006.

Web Links:

1. <https://www.samco.in/knowledge-center/articles/crude-oil-trading-the-ultimate-beginners-strategyguide/#:~:text=Strategies%20%26%20Tips%20for%20Crude%20Oil%20Trading%201,Trading%20Strategy.%20...%204%20Spread%20Trading%20Strategy.%20>
2. https://en.wikipedia.org/wiki/Natural_gas
3. <https://www.breakthroughfuel.com/blog/oil-in-motion-visibility-into-crude-oil-transportation>
4. <https://crp.trb.org/acrpwebresource2/overview-of-air-cargo-terminal-design-aspects/>
5. <https://www.osti.gov/biblio/780306>

FUNDAMENTALS OF CHEMICAL INDUSTRY
(Open Elective-I)

V Semester
Course Code: 201PT5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Outline the concept of chemical engineering principles
- CO2: Explain the components of chemical engineering
- CO3: Explain the concept of unit processes and unit operations
- CO4: Identify the role of computer in chemical engineering
- CO5: Distinguish various paradigm shifts in chemical engineering

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Chemistry, Chemical Engineering and Chemical Technology; Chemical process industries: History and their role in Society; Role of Chemical Engineer; History and Personalities of Chemical Engineering; Greatest achievements of Chemical Engineering.

Unit – II

Components of Chemical Engineering: Role of Mathematics, Physics, Chemistry and Biology; Thermodynamics, Transport Phenomena, Chemical Kinetics and Process dynamics, design and control.

Unit – III

Concept of Unit Processes and Unit Operations: Description of different Unit Processes and Unit Operations; Designing of equipments; Flowsheet representation of process plants, Evolution of an Industry – Sulphuric acid and Soda ash manufacture. Demonstration of simple chemical engineering experiments; Plant visit to a chemical industry

Unit – IV

Role of Computer in Chemical Engineering: Chemical Engineering Software; Visit to Process Simulation Lab; Relation between Chemical Engineering and other engineering disciplines; Traditional vs. modern Chemical Engineering; Versatility of Chemical Engineering: Role of Chemical Engineers in the area of Food, Medical, Energy, Environmental, Biochemical, Electronics etc. Plant visit to an allied industry.

Unit – V

Paradigm shifts in Chemical Engineering: Range of scales in Chemical Engineering; Opportunities for Chemical Engineers; Future of Chemical Engineering.

Text Books:

- 1 Introduction to Chemical Engineering, Salil K. Ghosal, Siddhartha Datta. Tata McGraw-Hill Education, 1993.
- 2 Introduction to Chemical Engineering, Badger W.L. and Banchero J.T., 6th Edition, Tata McGraw Hill, 1997.

Reference Books:

- 1 Outlines of Chemicals Technology, Dryden, C.E., Edited and Revised by Gopala Rao, M. and M.Sittig, 2nd Edition, Affiliated East-West press, 1993
- 2 Chemical Process Industries, Randolph Norris Shreve, George T. Austin, Shreve'e 5th edition, McGraw Hill, 1984

Web Links:

- 1 <https://www.britannica.com/science/chemistry#:~:text=chemistry%2C%20the%20science%20that%20deals,or%20absorbed%20during%20these%20processes>.
- 2 https://en.wikipedia.org/wiki/Chemical_engineering.
- 3 <https://chemicaltweak.com/unit-operation-and-unit-process/#:~:text=and%20unit%20process-,Unit%20Operation,are%20considered%20as%20unit%20operations>
- 4 [https://link.springer.com/chapter/10.1007/978-3-030-34387-3_84#:~:text=Currently%2C%20more%20and%20more%20computer,\(4\)%20cyberinfrastructure%2C%20informatics%20and](https://link.springer.com/chapter/10.1007/978-3-030-34387-3_84#:~:text=Currently%2C%20more%20and%20more%20computer,(4)%20cyberinfrastructure%2C%20informatics%20and)
- 5 <https://cordis.europa.eu/article/id/88076-paradigm-shift-for-chemical-process-engineering>

OVERVIEW OF MINING (Open Elective-I)

V Semester
Course Code:201MI5O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Analyze different stages in the life of a mine.
- CO2: Choose a suitable location for opening to a deposit.
- CO3: Organize for building appropriate permanent lining, drift with proper ventilation and lighting arrangements.
- CO4: Analyze the special methods need to be adopted for a particular situation.
- CO5: Distinguish the uses of explosives.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Mineral distribution in India and World. Contribution of mining to civilization, Stages in the life of a mine.

Unit – II

Overview of surface mining, surface mining methods. Unit operations, Mechanization of surface mines.

Unit – III

Overview of Underground Mines. Methods of Underground mining. Mechanization of underground mines.

Unit – IV

Safety practices in opencast and underground Mines

Unit – V

Impacts of Mining on environment.

Text Books:

1. D.J.Deshmukh, Elements of Mining Technology, Denett& Co., Nagpur Vol. I, 1998.
2. DrT.N.Singh, Surface Mining, Lovely Prakashan, Dhanbad ,2nd edition 2002.
3. B.V.Gokhale, Blasthole drilling Technology, multifields, Bombay, 1st edition 2001.

Reference Books:

1. Indian Bureau of Mines, Minerals Year Book & other publications, Latest Edition.
2. DrC.M.Kole, Khuli Khan KaAyojan (Hindi), CMPDIL, Ranchi , 1st edition 1996.
3. Dr. Calvin Konya; "Rock Blasting and Overbreak Control" Precision Blasting Services, Montville, Ohio 2nd edition, 2004.

Web Links:

1. <http://www.miningglobal.com/operations/gifs-5-stages-mining-life-cycle>
2. https://www.slideshare.net/umer_1/stages-in-life-of-mine
3. <https://www.minecationstandards.org/fileadmin/MAS/documents/nmas-national>
4. stabdards/afghanistan/AMAS_07.04_Storage_Transportation_Handling_of_Explosives.pdf

BASIC CROP PRODUCTION PRACTICES
(Open Elective-I)

V Semester
Course Code:201AG5O01

L T P C
2 0 2 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain factors affecting on crop growth and production.
- CO2: Explain crop selection and establishment of an adequate crop stand and ground cover.
- CO3: Explain crop water management using integrated water management methods.
- CO4: Apply agriculture crops production practices in field.
- CO5: Apply the horticulture crops production practices in field.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Agriculture and Crop Production: Introduction to agriculture and its crop production sub-sectors— field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices.

Unit – II

Crop Selection and Establishment: Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing

Unit – III

Crop Management: Crop water Management; a Crop nutrition management – need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients including fertigation scheduling; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.

Unit – IV

Production Practices of Agricultural Crops: Generalized management and cultivation practices for important groups of field crops in Andhra Pradesh: cereal crops, grain legumes, oil seed crops, sugarcane, and fiber crops, and special purpose crops such as those grown for green manure and fodder.

Unit – V

Production Practices of Horticultural Crops: Important basic groups of horticultural crops in A.P such as vegetable crops, fruit crops, flower crops; Cultivation practices of major fruits, major vegetables and major flowers of each group; Special features of production of horticultural crops – greenhouse cultivation, Organic farming, Zero budget farming, Vertical gardening and Kitchen farming.

Text Books:

1. Rajendra Prasad, Text Book of Field Crop Production. Directorate of Information and Publication, Krishi Anusandhan Bhavan, Pusa, New Delhi, 2015.
2. Reddy T. Sankara G.H. Yellamanda Reddi, Principles of Agronomy, Kalyani Publishers, New Delhi, 2005.
3. Handbook of Agriculture. ICAR Publications, New Delhi, 2011.

Reference Books:

1. Bose T. K. and L.P.Yadav. Commercial Flowers, Naya Prakash, Calcutta.1989.
2. Crop Production Guide, Tamil Nadu Agricultural University Publication, Coimbatore. 2005.
3. Kumar, N., Abdul Khader, M. Rangaswami, P. and Irulappan, I. Introduction to spices, plantation crops, medicinal and aromatic plants. Rajalakshmi Publications, Nagercoil. 1993.
4. Kumar, N., "Introduction to Horticulture", Rajalakshmi Publications. Nagercoil, 7th edition, 2015.
5. Shanmugavel, K.G. Production Technology of Vegetable Crops. Oxford India Publications, New Delhi. 1989.

Web Links:

1. <https://www.careerlauncher.com/cbse-ncert/class-8/Science/CBSE-CropProduction and Management-Notes.html#:~:text=%E2%80%A2Basic%20Practices%20of%20Crop,is%20called%20ploughing%20or%20tilling.>
2. https://www.edubeans.com/Class_VIII_Science_Crop-Production-and-Management.php
3. <https://byjus.com/biology/basic-practices-of-crop-production/>
4. <http://www.apagrisnet.gov.in/pdf/farmerbook.pdf>
5. [http://cbseacademic.nic.in/web_material/Curriculum/Vocational/2018/Basic%20Agriculture%20X%20\(408\).pdf](http://cbseacademic.nic.in/web_material/Curriculum/Vocational/2018/Basic%20Agriculture%20X%20(408).pdf)

GROUNDWATER, WELLS AND PUMPS (Open Elective-I)

V Semester
Course Code:201AG5O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain scenario, types and properties of various water bearing formations.
- CO2: Select appropriate method for exploration and replenishment of groundwater.
- CO3: Explain design, development and construction of wells.
- CO4: Determine the aquifer properties under unsteady state and steady state subsurface flow conditions.
- CO5: Explain the types, working principles with components and diagram of various water lifting devices and pumps.
- CO6: Select the pump for irrigation by considering performance characteristics, installation and troubleshooting.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	-	3	-	1	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-	-	-
CO4	1	-	2	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	-	3	1	-	3	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Occurrence and movement of ground water; aquifer and its types & properties; classification of wells, fully penetrating tube wells and open wells, familiarization of various types of bore wells.

Unit - II

Groundwater exploration techniques; methods of drilling of wells: percussion, rotary, reverse rotary; design of open wells; design of tube well and gravel pack, installation of well screen, completion and development of well.

Unit - III

Groundwater hydraulics- determination of aquifer parameters by different method such as Theis, Jacob and Chow's, Theis recovery method; well interference, multiple well systems, estimation of ground water potential, quality of ground water; artificial groundwater recharge techniques.

Unit - IV

Pumping systems: water lifting devices; different types of pumps, classification of pumps, component parts of centrifugal pumps, priming, pump selection, installation and troubleshooting, performance curves, effect of speed on capacity, head and power, effect of change of impeller dimensions on performance characteristics.

Unit – V

Propeller pumps; Mixed flow pumps and their performance characteristics; Vertical turbine pump-construction, installation, operation, maintenance and troubleshooting; and submersible pump- construction, installation, operation, maintenance and troubleshooting; hydraulic ram- principal of operation; Economics of pumping.

Text Books:

1. Water Well and Pumps, Michael AM, Khepar SD. and SK Sondhi, 2nd Edition,Tata Mc-Graw Hill, 2008.
2. Irrigation-Theory and Practice, Michael AM., 2nd Edition. Vikas Publishing House Pvt. Ltd, 2018.
3. Principles of Agricultural Engineering Vol-II, Michael A.M. and Ojha T.P. 5th Edition. Jain Brothers Publication, New Delhi, 2014.

Reference Books:

1. Land and Water Management Engineering, Murthy, V.V.N and Jha, M.K. Sixth Edition, Kalyani Publishers, Ludhiana, 2011.
2. Ground Water, Third Edition, New Age International, Raghunath, H.M. Publishers, New Delhi, 2007.
3. Groundwater Development and Management, Sarma, P.B.S., Allied Publishers Pvt. Ltd., New Delhi, 2009.
4. Ground Water Hydrology, Todd, D.K. John Wiley & Sons, New York, 2004.

Web Links:

1. <http://ecoursesonline.iasri.res.in/course/view.php?id=513>
2. <https://nptel.ac.in/courses/105/105/105105042/>

MEAN STACK TECHNOLOGIES
(Job Oriented Elective-I)

V Semester

Course Code: 201CS5J01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Build static web pages using HTML5.
- CO2:** Apply JavaScript to embed programming interface for web pages.
- CO3:** Build a basic web server using Node.js, NPM and Express.js.
- CO4:** Apply typescript for strict typing in applications and perform CRUD operations using MongoDB.
- CO5:** Develop responsive web pages using Angular.

Mapping of course outcomes with program outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	-	1	-	-	-	-	-	-	2
CO2	2	2	2	-	1	-	-	-	-	-	-	2
CO3	1	2	2	-	3	-	-	-	-	-	-	2
CO4	2	2	2	1	3	-	-	-	-	-	-	2
CO5	2	2	2	1	3	-	-	-	-	-	-	2

Mapping of course outcomes with program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-

UNIT-I:

HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, HTML - Need, Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Sectioning Elements, Paragraph Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing and cellpadding attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers, Select and Datalist Elements, Editing Elements, Media, Iframe, Why HTML Security, HTML Injection, Clickjacking, HTML5 Attributes & Events Vulnerabilities, Local Storage Vulnerabilities, HTML5 - Cross-browser support, Best Practices For HTML Web Pages.

UNIT-II:

Javascript: Why we need JavaScript, What is JavaScript, Environment Setup, Working with Identifiers, Type of Identifiers, Primitive and Non Primitive Data Types, Operators and Types of Operators, Types of Statements, Non - Conditional Statements, Types of Conditional Statements, If and Switch Statements, Types of Loops, Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in

Functions, Working With Classes, Creating and Inheriting Classes, In-built Events and Handlers, Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser and Document Object Model, Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods, Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

UNIT-III:

Node.js: Why and What Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.

Express.js: Express Development Environment, Defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middlewares, Types of Middlewares, Connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

UNIT-IV:

TypeScript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V:

What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Change Detection, Structural Directives - ngIf, ngFor, ngSwitch, Custom Structural Directive, Attribute Directives - ngStyle, ngClass, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child Component to ContainerComponent, Shadow DOM, Component Life Cycle, Template Driven Forms, Model Driven Forms or Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Web Links:

1. [https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview_\(HTML5\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview_(HTML5))
2. [https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview_\(Javascript\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview_(Javascript))
3. [https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview_\(Node.js & Express.js\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview_(Node.js & Express.js))
4. [https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview_\(Typescript\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview_(Typescript))
5. [https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview_\(Angular JS\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview_(Angular JS))
6. [https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview_\(MongoDB\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview_(MongoDB))

*** Extra concepts to be learned for industry purpose on student interest. Not for exam purpose:** Javascript- Why and What JavaScript Security, Security challenges in JavaScript, Cross-site scripting (XSS), XSS Mitigation Techniques, Best Practice.

Typescript: Capstone Project.

Angular JS: Angular Capstone Projects

MongoDB - BSON, Extended JSON Modes, BSON Type Identifiers, Installing MongoDB on the Dedicated or VPS server, Reading Documents, Cursor, Introduction to Operators, Embedded Documents, Fields Filtering, Introduction to the Document Updates, Update Methods Syntax, Positional Operator \$, Delete Operations, Aggregation Framework, Indexes Overview, Index Creation Process, Query Performance and explain(),MongoDB Utilities, mongoexport, mongoimport, mongodump.

COMPUTER NETWORKS LAB
Common to CSE&IT

VSemester
Course Code: 201CS5L01

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Analyze network devices and framing methods.
- CO2:** Demonstrate the working of error detection and correction techniques.
- CO3:** Make use of various routing algorithms for effective data transmission
- CO4:** Discuss various sliding window Protocols.
- CO5:** Make use of congestion control algorithm for traffic shaping.
- CO6:** Demonstrate the working of packet transfer with and without network management tools.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	1	-	-	-	1	2	-	1
CO2	2	2	2	-	1	-	-	-	1	2	-	1
CO3	2	2	2	2	1	-	-	-	1	2	-	1
CO4	1	1	1	1	1	-	-	-	1	2	-	1
CO5	2	2	2	1	1	-	-	-	1	2	-	1
CO6	1	2	2	-	1	-	-	-	1	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week – 1

Study of Network devices in detail and connect the computers in Local Area Network.

Week – 2

Write a Program to implement the data link layer framing methods such as i) Character stuffing ii) bit stuffing.

Week – 3

Write a Program to implement data link layer framing method checksum.

Week – 4

Write a program for Hamming Code generation for error detection and correction.

Week – 5

Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.

Week – 6

Write a Program to implement Sliding window protocol for Goback N.

Week – 7

Write a Program to implement Sliding window protocol for Selective repeat.

Week – 8

Write a Program to implement Stop and Wait Protocol.

Week – 9

Write a program for congestion control using leaky bucket algorithm

Week – 10

Write a Program to implement Dijkstra's algorithm to compute the Shortest path through a graph.

Week – 11

Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).

Week – 12

Write a Program to implement Broadcast tree by taking subnet of hosts.

List of Augmented Experiments:

13. How to run Nmap scan
14. Operating System Detection using Nmap
15. Do the following using NS2 Simulator i. NS2 Simulator-Introduction ii. Simulate to Find the Number of Packets Dropped iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
16. Do the following using NS2 Simulator i. Simulate to Find the Number of Packets Dropped due to Congestion ii. Simulate to Compare Data Rate& Throughput.

Reference Books:

1. Data Communications and Networking – Behrouz A. Forouzan, 5th Edition, McGraw Hill Education, 2012.
2. Computer Networks – A system's approach, Larry L Peterson, Bruce S Davie, 5th Edition, Elsevier, 2011.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 6th Edition, Pearson Education, 2013.

Web Links:

1. <https://www.coursera.org/learn/fundamentals-network-communications>.
2. <https://www.udemy.com/course/introduction-to-networking-for-complete-beginners/>
3. <http://www.askforprogram.in/p/computer-ne.html>
4. <http://www.scribd.com/doc/58478622/Computer-Networks-Forouzan>.
5. <https://www.udacity.com/course/computer-networking>

DATA MINING LAB
Common to CSE&IT

VSemester
Course Code: 201CS5L02

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Design a data mart or data warehouse for any organization
- CO2:** Interpret characteristics of data Sets using WEKA Tool
- CO3:** Experiment different pre-processing techniques in Data Mining
- CO4:** Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
- CO5:** Apply the suitable visualization techniques to output analytical results
- CO6:** Identify appropriate data mining algorithm for solving practical problems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	2	-	-	-	1	2	-	2
CO2	2	1	-	3	2	-	-	-	1	2	-	-
CO3	2	3	-	2	2	-	-	-	1	2	-	1
CO4	2	3	2	2	2	-	-	-	1	2	-	2
CO5	2	2	2	2	2	-	-	-	1	2	-	2
CO6	2	3	2	2	2	-	-	-	1	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	1
CO2	-	1
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

List of Experiments:

Week – 1

Creation of a Data Warehouse.

Build Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration Tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects,etc.,)

Design multi-dimensional data models namely Star, Snowflake and Fact Constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, manufacturing, Automobiles, sales etc).

Write ETL scripts and implement using data warehouse tools.

Perform Various OLAP operations such as slice, dice, roll up, drill up and pivot

Week – 2

Explore machine learning tool “WEKA”

Study the arff file format Explore the available data sets in WEKA. Load a data set (ex. Weather dataset, Iris dataset, etc.)

Load each dataset and observe the following:

1. List the attribute names and they types
2. Number of records in each dataset
3. Identify the class attribute (if any)

4. Plot Histogram
5. Determine the number of records for each class.
6. Visualize the data in various dimensions

Week – 3

Perform following data preprocessing tasks using Python

- i) Rescale Data
- ii) Binarize Data
- iii) Standardize Data

Week – 4

Write a program to calculate chi-square value using Python. Report your observation

Week – 5

Demonstrate performing classification on data sets

Load each dataset into Weka and run ID3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.

Extract if-then rules from the decision tree generated by the classifier. Observe the confusion matrix.

Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.

Plot ROC Curves

Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

Week – 6

Demonstrate ZeroR technique on Iris dataset (by using necessary preprocessing technique(s)) and share your observations (using WEKA)

Week – 7

Write a program of Naive Bayesian classification using Python programming language

Week – 8

Demonstrate performing clustering of data sets

Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters).

Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.

Explore other clustering techniques available in Weka.

Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

Week – 9

Write a program of cluster analysis using simple k-means algorithm Python programming language

Week – 10

Write a Python program to generate frequent item sets / association rules using Apriori algorithm

Week – 11

Write a Python program to generate frequent item sets / association rules using FP-growth Tree algorithm

Week – 12

Visualize the datasets using matplotlib in python.(Histogram, Box plot, Bar chart, Pie chart etc.,)

List of Augmented Experiments:

13. Write a Python program to prepare a simulated data set with unique instances.
14. Write a program to compute/display dissimilarity matrix (for your own dataset containing at least four instances with two attributes) using Python
15. Write a program of cluster analysis using DB SCAN algorithm Python programming language
16. Demonstrate Web/Text Mining using WEKA Tool

Reference Books:

1. Learning Data Mining with Python , Second Edition, Robert Layton,PacktPublishers
2. Java Data Mining: Strategy, Standard, and Practice: A Practical Guide for Architecture, Design, and Implementation,Mark F. Hornick , Erik Marcadé, Sunil Venkayala,Kindle Publishers

Web Links:

1. <https://nptel.ac.in/courses/106107220>
2. <https://dzone.com/refcardz/data-mining-discovering-and>
3. <https://www.springboard.com/blog/data-science/data-mining-python-tutorial/>
4. <https://www.cs.waikato.ac.nz/ml/weka/book.html>
5. <http://facweb.cs.depaul.edu/mobasher/classes/ect584/weka/index.html>

SUMMER INTERNSHIP - I

VSemester **L** **T** **P** **C**
Course Code: 201CS5P01 0 0 3 1.5

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Conduct a technical survey to identify a real world engineering problem
- CO2:** Analyze the industrial plant layout using technical expertise
- CO3:** Compare theoretical and real work environments in technical perspective
- CO4:** Identify the challenges in the execution of operations
- CO5:** Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	-	-	-	-	-	-	-	1	-	1
CO2	3	-	-	-	-	1	1		-	-	-	1
CO3	3	-	-	-	-	-	-	-	-	1	1	1
CO4	1	1	3	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	2	1	1	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	1
CO2	1	1
CO3	1	2
CO4	1	1
CO5	1	2

Guidelines:

1. The Internship is a team activity of 3 to 4 students.
2. The students can undergo Industrial Training / Internship at Govt. Organizations, software MNCs or do Research projects in National Laboratories/Academic Institutions like IITs, NITs etc. during summer breaks after completion of IV Semester.
3. Community Service Project is an alternative to the Summer Internship, whenever there is an exigency and students cannot pursue their Summer Internship. A group of students or even a single student can take up the Community Service Project during summer breaks. However, a student can opt for this only once. The students have to identify social problems existing in any geographical area/village and try to solve them technically or suggest to people the necessary solutions for solving these problems.
4. Prior letter and approval from the Head of the Department must be taken before applying to any organization for the fulfilment of this course.

5. Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
6. Each class/section should be assigned with a Project Coordinator.
7. The students are motivated to do projects based on societal needs using emerging technologies like IoT, Machine learning, Deep Learning, Cyber security, cloud computing etc.,
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. After successful completion, students shall submit a summer internship technical report to the department concerned.
10. The student shall appear for the oral presentation before the Project Review Committee (PRC)* and an External Examiner.

ROBOTIC PROCESS AUTOMATION
(Skill Oriented Course – Module III)
Common to CSE & IT

V Semester
Course Code:201CS5S01

L	T	P	C
0	0	4	2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make use of different Workflows available in UiPath.
- CO2:** Develop simple Process workflows using various control structures.
- CO3:** Make use of various activities and will be able to perform Operations on an Excel file.
- CO4:** Make use of Exception handling and handling user events.
- CO5:** Design, Build and test a process workflow for any project.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	2	2	-	-
CO2	1	2	1	-	2	-	-	-	2	2	-	-
CO3	2	2	-	-	-	-	-	-	2	2	-	-
CO4	2	2	-	-	1	-	-	-	2	2	-	-
CO5	2	1	2	-	3	-	-	-	2	2	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	3	-
CO5	3	-

List of Experiments:

Week – 1

Record and play

Design a process to demonstrate the use of Application Recorder and Play the Whole Recorded Process.

Design a process to demonstrate the use of Web Recorder and Play the Whole Recorded Process.

Week – 2

Workflows

Design a process to demonstrate the use of a Flowchart activity.

Design a process to demonstrate the use of a Sequence activity.

Week – 3

Control Structures

Design a process to demonstrate the use of While and Do-While loops..

Design a process to demonstrate the use of For – Each loop.

Week – 4

Decision Making

Design a process to demonstrate the use of Decision Making Statements

Design a process to demonstrate the use of Switch Activity.

Week – 5

Data Manipulation

Design a process to create a Data Table Manually adding the fields student no, name, and marks in different subjects. Display the result in a message box.

Design a process to create a Data Table Dynamically by Selecting the data from any web site and display the result in a message box.

Week – 6

Clipboard Management

Design a process to type the text “Aditya College” in a Notepad Application.

Design a Process to select the text typed in notepad and display the contents on the screen.

Design a process to send the value present in a string variable to the notepad application.

Week – 7

File Transfer

Design a process to demonstrate the use of Read and Write Cell

Design a process to demonstrate the use of Read and Write Range

Week – 8

Handling Mouse Events

Design a process to demonstrate how to handle mouse click and double click activity

Design a process to demonstrate how to handle mouse Hover activity

Week – 9

Handling Keyboard activities

Design a process to demonstrate how to handle keyboard activities – Send hotkey, Type into, Type secure text.

Week – 10

Scraping

Design a process to demonstrate how to scrape the data using Screen Scraper Wizard.

Week – 11

Scraping – Continued

Design a process to demonstrate Scraping using Microsoft OCR

Design a process to demonstrate Scraping using Google OCR

Week – 12

Exception Handling

Design a process to demonstrate the use of try catch and finally in a project

List of Augmented Experiments:

13. Design a process workflow to monitor a copying event and block it.
14. Design a process workflow to launch an assistant bot on a keyboard event.
15. Design a process workflow to use config files in a project.
16. Design a project to publish a workflow in UiPath.

Text Books:

1. Alok Mani Tripathi "Learning Robotic Process Automation", Packt Publishers, ISBN 13: 9781788470940, Paperback,

Reference Books:

1. Richard Murdoch, "Robotic Process Automation: Guide to building Robots, Automate Repetitive Tasks & Become An RPA Consultant", ISBN-10: 1983036838, ISBN-13: 978-1983036835
2. Kelly Wibbenmeyer, "The Simple implementation Guide to Robotic Process Automation (RPA)", iuniverse ISBN-10: 1532045883, ISBN-13: 978 - 1532045882.

Web Links:

1. <https://www.udemy.com/topic/robotic-process-automation>
2. <https://www.uipath.com/rpa/academy>
3. <https://www.youtube.com/watch?v=MBI-3Yb30FA>
4. <https://www.coursera.org/learn/robotic-process-automation>

MEAN STACK TECHNOLOGIES LAB MODULE – I
Skill Oriented Course-III

V Semester
Course Code: 201CS5S02

L T P C
0 0 4 2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop professional web pages of an application using HTML elements like lists, navigations, tables, images and various form elements
- CO2:** Make use of the new features of HTML 5.0 that includes media – audio and video, web page division – header, footer, nav, section, article aside and also embed CSS Styles.
- CO3:** Utilize Javascript for developing interactive HTML web pages and validate form data.
- CO4:** Build a basic web server using Node.js and also working with Node Package Manager (NPM).
- CO5:** Build a web server using Express.js
- CO6:** Make use of Typescript to optimize JavaScript code by using the concept of strict type checking.

Mapping of course outcomes with program outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	2	-	-	-	1	2	-	2
CO2	2	2	3	-	2	-	-	-	1	2	-	2
CO3	2	3	2	-	2	-	-	-	1	2	-	2
CO4	2	2	2	1	3	-	-	-	1	2	-	2
CO5	2	2	2	1	3	-	-	-	1	2	-	2
CO6	2	2	3	1	3	-	-	-	1	2	-	2

Mapping of course outcomes with program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

1.a Course Name: HTML5 - The Language

Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element

Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2832066771144660000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

1.b Course Name: HTML5 - The Language

Module Name: Sectioning Elements

Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.

<https://infyspringboard.onwingspan.com/web/en/viewer/web->

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6372291347110857000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

1.c Course Name: HTML5 - The Language

Module Name: Paragraph Element, Division and Span Elements, List Element

Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32785192040894940000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

1.d Course Name: HTML5 - The Language

Module Name: Link Element

Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15515105953273338000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

1.e Course Name: HTML5 - The Language

Module Name: Character Entities

Add the © symbol in the Home page footer of IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_547667376938096260_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

1.f Course Name: HTML5 - The Language

Module Name: HTML5 Global Attributes

Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28723566050321920000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

2.a Course Name: HTML5 - The Language

Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan

Attributes, border, cellspacing, cellpadding attributes

Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013168035284033536113_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

2.b Course Name: HTML5 - The Language

Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements

Using the form elements create Signup page for IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13975270903118459000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

2.c Course Name: HTML5 - The Language

Module Name: Input Elements - Attributes

Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input elements.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14048414537062347000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

2.d Course Name: HTML5 - The Language

Module Name: Media, Iframe

Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30738402225794945000_shared?collectionId=lex_17739732834840810000_shared&collectionType=Course

3.a Course Name: Javascript**Module Name:** Type of Identifiers

Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const).

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053264414818304732_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

3.b Course Name: Javascript**Module Name:** Primitive and Non Primitive Data Types

Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21528322245232402000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

3.c Course Name: Javascript**Module Name:** Operators and Types of Operators

Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13808338384481720000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

3.d Course Name: Javascript**Module Name:** Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements

Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If seats to be booked are more than 2 but less than 6, based on the number of seats booked, do the following - Calculate total cost by applying discounts of 3, 5, 7, 9, 11 percent, and so on for customer 1,2,3,4 and 5. Try the code with different values for the number of seats.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_16257498471333610000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

3.e Course Name: Javascript**Module Name:** Types of Loops

Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If seats to be booked are more than 2 but less than 6, based on the number of seats booked, do the following - Calculate total cost by applying a discount of 3, 5, 7, 9, 11 percent, and so on for customers till 5 respectively. Try the code with different values for the number of seats. Implement the problem statement using 'for' loop, 'while' loop and 'do-while' loop.

<https://infyspringboard.onwingspan.com/web/en/viewer/web->

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6238536888292970000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4.a Course Name: Javascript

Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions

Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If seats to be booked are more than 2 but less than 6, based on the number of seats booked, do the following - Calculate total cost by applying a discount of 3, 5, 7, 9, 11 percent, and so on for customers till 5 respectively. Try the code with different values for the number of seats. Write the following custom functions to implement given requirements: i. calculateCost(seats): Calculate and display the total cost to be paid by the customer for the tickets they have bought. ii. calculateDiscount(seats): Calculate discount on the tickets bought by the customer. Implement using arrow functions.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15455199570613326000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4.b Course Name: Javascript

Module Name: Working With Classes, Creating and Inheriting Classes

Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize the values (iii) Create a class Employee extending Person with additional attributes role and contact (iv) The constructor of the Employee to accept the name, age, role and contact where name and age are initialized through a call to super to invoke the base class constructor (v)Add a method getDetails() to display all the details of Employee.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811117760512458_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4.c Course Name: Javascript

Module Name: In-built Events and Handlers

Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If seats to be booked are more than 2 but less than 6, based on the number of seats booked, do the following - Calculate total cost by applying discounts of 3, 5, 7, 9, 11 percent, and so on for customer 1,2,3,4 and 5. Try the code with different values for the number of seats. Write the following custom functions to implement given requirements: (i) calculateCost(seats): Calculate and display the total cost to be paid by the customer for the tickets he has bought. (ii) calculateDiscount(seats): Calculate discount on the tickets bought by the customer. Invoke this function only when the user clicks on a link/button.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4.d Course Name: Javascript

Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object Model

If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they

should see a re-filled cone, a different heading, a different message, and a different color in the background.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

5.a Course Name: Javascript

Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods

Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

5.b Course Name: Javascript

Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API

Simulate a periodic stock price change and display on the console. Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when the count is 5 – use the setInterval method. (iii) Since setInterval is an async method, enclose the code in a Promise and handle the response generated in a success callback. (iv) The random value returned from the method every time can be used as a stock price and displayed on the console.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012599811633905664460_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

5.c Course Name: Javascript

Module Name: Creating Modules, Consuming Modules

Validate the user by creating a login module. Hints: (i) Create a file login.js with a User class. (ii) Create a validate method with username and password as arguments. (iii) If the username and password are equal it will return "Login Successful" else will return "Unauthorized access". (iv) Create an validateUser.html file with textboxes username and password and a submit button. (v) Add a script tag in HTML to include validateUser.js file. (vi) Create an validateUser.js file which imports login module and invokes validate method of User class. (vii) On submit of the button in HTML the validate method of the User class should be invoked. (viii) Implement the validate method to send the username and password details entered by the user and capture the return value to display in the alert.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013052857053585408667_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

6.a Course Name: Node.js

Module Name: How to use Node.js

Verify how to execute different functions successfully in the Node.js platform.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19002830632103186000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

6.b Course Name: Node.js

Module Name: Create a web server in Node.js

Write a program to show the workflow of JavaScript code executable by creating web server in Node.js.

<https://infyspringboard.onwingspan.com/web/en/viewer/web->

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28177338996267815000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

6.c Course Name: Node.js

Module Name: Modular programming in Node.js

Write a Node.js module to show the workflow of Modularization of Node application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28865394191004004000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

6.d Course Name: Node.js

Module Name: Restarting Node Application

Write a program to show the workflow of restarting a Node application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

6.e Course Name: Node.js

Module Name: File Operations

Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33376440180246100000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

7.a Course Name: Express.js

Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters

Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_29394215542149950000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

7.b Course Name: Express.js

Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares

In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13930661312009580000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

7.c Course Name: Express.js

Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults

Write a Mongoose schema to connect with MongoDB.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01303558775485440691_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

7.d Course Name: Express.js

Module Name: Models

Write a program to wrap the Schema into a Model object.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035593896869888662_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8.a Course Name: Express.js

Module Name: CRUD Operations

Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8.b Course Name: Express.js

Module Name: API Development

In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - <http://localhost:3000/notes/7555> (ii) API should update the details based on the name which is provided in the URL and the data in the request body. Test URL - <http://localhost:3000/notes/Mathan Note>: Only one document in the collection needs to be updated. (iii) API should delete the details based on the name which is provided in the URL. Test URL - <http://localhost:3000/notes/Mathan Note>: Only one document in the collection needs to be deleted.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8.c Course Name: Express.js

Module Name: Why Session management, Cookies

Write a program to explain session management using cookies.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8.d Course Name: Express.js

Module Name: Sessions

Write a program to explain session management using sessions.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8.e Course Name: Express.js

Module Name: Why and What Security, Helmet Middleware

Implement security features in myNotes application

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

9.a Course Name: Typescript

Module Name: Basics of TypeScript

On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9.b Course Name: Typescript

Module Name: Function

Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9.c Course Name: Typescript

Module Name: Parameter Types and Return Types

Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9.d Course Name: Typescript

Module Name: Arrow Function

Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equal to 150 dollars then below mentioned code-snippet would fit into this requirement.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712910875500544904_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9.e Course Name: Typescript

Module Name: Optional and Default Parameters

Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function should return Moto mobile list and if manufacturer parameter is either Samsung/Apple then this function should return respective mobile list and similar to make Samsung as default Manufacturer. Below mentioned code-snippet would fit into this requirement.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712914940641280906_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10.a Course Name: Typescript

Module Name: Rest Parameter

Implement business logic for adding multiple Product values into a cart variable which is type of string array.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712921860915200909_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10.b Course Name: Typescript

Module Name: Creating an Interface

Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10.c Course Name: Typescript

Module Name: Duck Typing

Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712925995458560912_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10.d Course Name: Typescript

Module Name: Function Types

Declare an interface with function type and access its value.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

11.a Course Name: Typescript

Module Name: Extending Interfaces

Declare a productList interface which extends properties from two other declared interfaces like Category,Product as well as implementation to create a variable of this interface type.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712951652139008920_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

11.b Course Name: Typescript**Module Name:** Classes

Consider the Mobile Cart application, Create objects of the Product class and place them into the productList array.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3705824317381604400_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

11.c Course Name: Typescript**Module Name:** Constructor

Declare a class named - Product with the below-mentioned declarations: (i) productId as number property (ii) Constructor to initialize this value (iii) getProductId method to return the message "Product id is <>id value<>".

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712954616782848927_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

11.d Course Name: Typescript**Module Name:** Access Modifiers

Create a Product class with 4 properties namely productId, productName, productPrice, productCategory with private, public, static, and protected access modifiers and accessing them through Gadget class and its methods.

https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712953517170688931_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

12.a Course Name: Typescript**Module Name:** Properties and Methods

Create a Product class with 4 properties namely productId and methods to setProductId() and getProductId().

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9356738095572543000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

12.b Course Name: Typescript**Module Name:** Creating and using Namespaces

Create a namespace called ProductUtility and place the Product class definition in it.

Import the Product class inside productList file and use it.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_20787271128051925000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

12.c Course Name: Typescript**Module Name:** Creating and using Modules

Consider the Mobile Cart application which is designed as part of the functions in a module to calculate the total price of the product using the quantity and price values and assign it to a totalPrice variable.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24788158187785620000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

12.d Course Name: Typescript**Module Name:** What is Generics, What are Type Parameters, Generic Functions,

Generic Constraints

Create a generic array and function to sort numbers as well as string values.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_446287045482942800_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

List of augmented experiment:

13. Design any front end web application using HTML, CSS and validate client side using Javascript. Also use typescript, Node.js, Express.js wherever applicable.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. [\(HTML5\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_17739732834840810000_shared/overview)
2. [\(Javascript\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_18109698366332810000_shared/overview)
3. [\(Node.js & Express.js\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview)
4. [\(Typescript\)](https://infyspringboard.onwingspan.com/en/app/toc/lex_9436233116512678000_shared/overview)

INTELLECTUAL PROPERTY RIGHTS AND PATENTS
Common to all branches

VSemester
Course Code:201MC5T01

L	T	P	C
2	0	0	0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1: Compare various types of Intellectual Property rights.
- CO2: Discuss Intellectual Property and infer rights on such Intellectual Property owners
- CO3: Explain the process of patenting
- CO4: Apply for Trade marks and Copyrights.
- CO5: Explain the methods to protect Trade secrets
- CO6: Interpret the legal issues on Intellectual Property Rights and cyber laws

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	-	3	-	-	-	2
CO2	1	-	-	-	-	1	-	3	-	-	-	2
CO3	1	-	-	-	-	1	-	3	-	-	-	2
CO4	1	-	-	-	-	1	-	3	-	-	-	2
CO5	1	-	-	-	-	1	-	3	-	-	-	2
CO6	1	-	-	-	-	1	-	3	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit – I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO –Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR – Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit – II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

Unit – III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Double Patenting — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

Unit – IV

Trademarks and Trade secrets: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing off Action - Introduction to Trade Secrets – General Principles - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements.

Unit – V

Cyber Law and Cyber Crime : Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers. Relevant Cases Shall be dealt where ever necessary.

Text Books:

1. Fundamentals of IPR for Engineers- Kompal Bansal & Parishit Bansal, B. S. Publications (Press), 2013
2. Intellectual Property -Deborah E.Bouchoux, Third Edition, Cengage Learning, New Delhi, 2012

Reference Books:

1. Intellectual property rights- Prabuddha Ganuli, Tata Mcgraw hill, 2012
2. Intellectual property rights M.Ashok kumar and Mohd.Iqbal Ali:, Serials Publications, 2015
3. Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi, 2015.
4. Intellectual Property- Richard Stim, Cengage Learning, New Delhi, 2012.

Web Links:

1. <http://www.wipo.int/portal/en/index.html>
2. <https://indiankanoon.org/>
3. <http://www.ipindia.nic.in/patents.htm>
4. <http://www.ipindia.nic.in/trade-marks.htm>
5. <http://copyright.gov.in>

NATURAL LANGUAGE PROCESSING
(Honors)

V Semester
Course Code:201CS5H01

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Describe the key concepts from NLP which are used to describe and analyze language
- CO2:** Explain POS tagging and context free grammar for English language.
- CO3:** Make use of the rule based system to tackle morphology/syntax of a language.
- CO4:** Demonstrate semantics and pragmatics of English language for processing
- CO5:** Compare the use of different statistical approaches for different types of NLP applications

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	3	3	-	-	-	-	-	-	-	-
CO2	-	1	3	3	-	-	-	-	-	-	-	-
CO3	-	3	1	1	-	-	-	-	-	-	-	-
CO4	-	1	1	1	2	-	-	-	-	-	-	-
CO5	-	1	1	1	2	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	2	-
CO5	2	-

Unit - I

Introduction : Origins and challenges of NLP – Language Modelling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

Unit – II

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Unit – III

Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebank's, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures

Unit – IV

Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods

Unit – V

Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co referenceResolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WorldNet,PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, PearsonPublication, 2014
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009

Reference Books:

1. CK Baldwin, Language processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015
2. Richard M Reese,Natural Language Processing with Java, O'Reilly Media, 2015
3. NitinIndurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second, Chapman and Hall/CRC Press, 2010
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008

Web Links:

1. <http://nptel.ac.in/courses/106104123/>
2. <http://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/>
3. <http://www.geeksforgeeks.org/compiler-design-tutorials/>
4. <http://nptel.ac.in/courses/106106049/>

COMPUTATIONAL NUMBER THEORY
(Honors)

V Semester
Course Code:201CS5H02

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop the mathematical skills to solve number theory problems and to develop the mathematical skills of divisions, congruence's, and number functions.
- CO2:** Describe the history of number theory and its solved and unsolved problems
- CO3:** Investigate applications of number theory and the use of computers in a Number theory
- CO4:** Estimate the time and space complexities of various Secure Algorithms.
- CO5:** Summarize various factorization and logarithmic methods.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	1
CO2	1	1	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	2	-
CO4	2	-
CO5	1	-

Unit - I

Arithmetic of Integers: Basic Arithmetic Operations, GCD, Congruences and Modular Arithmetic, Linear Congruences, Polynomial Congruences, Quadratic Congruences, Multiplicative Orders, Continued Fractions, Prime Number Theorem and Riemann Hypothesis, Running Times of Arithmetic Algorithms.

Unit – II

Arithmetic of Finite Fields: Existence and Uniqueness of Finite Fields, Representation of Finite Fields, Implementation of Finite Field Arithmetic, Arithmetic of Polynomials: polynomials over Finite Fields, Finding Roots of Polynomials over Finite Fields, Factoring Polynomials over Finite Fields, Properties of Polynomials with Integer Coefficients, Factoring Polynomials with Integer Coefficients.

Unit – III

Arithmetic of Elliptic Curves: Elliptic Curve, Elliptic-Curve Group, Elliptic Curve over Finite Fields, Pairing on Elliptic Curves, Elliptic-Curve Point Counting, Primality Testing: Introduction, Probabilistic Primality Testing, Deterministic Primality Testing, Primality Testing for Number of Special Forms.

Unit – IV

Integer Factorization: Trial Division, Pollard's Rho Method, Pollard's p-1 Method, Dixon's Method, CFRAC Method, Quadratic Sieve Method, Cubic Sieve Method, Elliptic Curve Method, Number-Field Sieve Method, Discrete Logarithms: Square-Root Methods, Algorithms: Prime Fields, Fields of Characteristic Two, General Extension Fields, Elliptic Curves(ECDLP).

Unit – V

Large Sparse Linear Systems: Structured Gaussian Elimination, Lanczos Method, Wiedemann Method,

Text Books:

1. Abhijit Das, Computational Number Theory, CRC Hall, 1st Edition, 2013.
2. T. H. Cormen, C. E. Leiserson, R. Rivest and C. Stein, Introduction to Algorithms, Prentice Hall India,

Reference Books:

1. Serge Vaudenay: "Classical Introduction to Cryptography – Applications for Communication Security", Springer, 2006
2. Victor Shoup: "A Computational Introduction to Number Theory and Algebra", Cambridge University Press, 2005
3. A. Manezes, P. Van Oorschot and S. Vanstone: "Hand Book of Applied Cryptography", CRC Press, 1996

Web Links:

1. <https://archive.nptel.ac.in/courses/106/103/106103015/>
2. <https://www.coursera.org/learn/fibonacci>
3. <https://www.udemy.com/course/introduction-to-number-theory/>
4. <https://www.udemy.com/course/number-theory-modular-arithmetic/>
5. <https://www.coursera.org/learn/mathematical-thinking>

COMPUTER NETWORKS (Minor)

V Semester
Course Code:201CS5M01

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain the computer network fundamentals and reference models.
- CO2:** Identify data link layer services and functions.
- CO3:** Classify MAC layer protocols and LAN technologies.
- CO4:** Apply various routing algorithms and Congestion control techniques for effective data transmission.
- CO5:** Utilize the services provided by the transport layer and application layer.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	-	-	-	-	-	-	-	-
CO2	1	2	3	-	-	-	-	-	-	-	-	-
CO3	3	1	2	-	-	-	-	-	-	-	-	-
CO4	1	2	2	3	-	-	-	-	-	-	-	-
CO5	3	1	2	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	2	-
CO4	1	-
CO5	2	-

Unit – I

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model, the TCP/IP Reference Model , A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History.

Physical Layer: Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

Unit – II

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol,

Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi link PPP.

Unit – III

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance,

Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA).

Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

Unit – IV

The Network Layer Design Issues: Store and Forward Packet Switching, Services Provided to the Transport layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms: The Optimality principle, Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms: General principles of congestion control, Congestion prevention policies, Approaches to Congestion Control, Traffic Aware Routing, Admission Control, Traffic Throttling, Load Shedding, Traffic Control Algorithm:Leaky bucket & Token bucket.

Internet Working: Network layer in the internet, IP protocols: IP Version 4,IP Version 6,Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6,Internet control protocols: ICMP, ARP, DHCP

Unit – V

The Transport Layer: Transport layer protocols: Introduction, services, port number, User data gram protocol: UDP services, UDP applications,

Transmission control protocol: TCP services, TCP features, Segment, A TCP connection, windows in TCP, flow control, Error control, Congestion control in TCP.

Application Layer: World Wide Web: HTTP, Electronic mail, Architecture, web based mail, email security, TELENET, local versus remote Logging, Domain Name System: Name Space, DNS, SNMP.

Text Books:

1. Computer Networks — Andrew S Tanenbaum and David J Wetherall, 5th Edition, Pearson Education, 2013.
2. Data Communications and Networking – Behrouz A. Forouzan, 5th Edition, McGraw Hill Education, 2012.

Reference Books:

1. Data Communications and Networks- Achut S Godbole, AtulKahate
2. Computer Networks, Mayank Dave, CENGAGE
3. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education.

Web Links:

1. <https://nptel.ac.in/courses/106105081>
2. <https://www.coursera.org/learn/fundamentals-network-communications>
3. <https://nptel.ac.in/courses/106/106/106106091/>
4. <https://www.udemy.com/course/mta-networking-fundamentals/>

DATABASE MANAGEMENT SYSTEMS
(Minor)

VSemester
Course Code:201CS5M02

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Summarize the database characteristics and identify various database architectures.
- CO2:** Interpret relational database using SQL
- CO3:** Examine issues in data storage and query processing for appropriate
- CO4:** Make use of normalization techniques for database design
- CO5:** Illustrate the mechanisms of transaction management.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	1
CO2	1	2	3	-	-	-	-	-	-	-	-	2
CO3	2	3	1	-	-	-	-	-	-	-	-	1
CO4	2	2	3	-	-	-	-	-	-	-	-	2
CO5	3	1	2	-	-	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	1	-
CO3	3	-
CO4	1	-
CO5	2	-

Unit – I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Unit – II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance

Unit – III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Unit – IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

Unit – V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification Storage, Recovery and Atomicity, Recovery algorithm.

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2. Database System Concepts, 5/e, Silberschatz, Korth, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. <https://www.geeksforgeeks.org/introduction-to-nosql/>
3. <https://beginnersbook.com/2015/05/normalization-in-dbms/>

INTERNET OF THINGS (Minor)

V Semester
Course Code:201CS5M03

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain in a concise manner how the general Internet as well as Internet of Things work.
- CO2:** Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- CO3:** Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- CO4:** Develop prototype models for various applications using IoT technology
- CO5:** Explain in a concise manner how the general Internet as well as Internet of Things work

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	-	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	-
CO3	2	3	-	2	-	-	-	-	-	-	-	-
CO4	2	3	1	2	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	1	-
CO4	1	-
CO5	2	-

Unit - I

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet

Unit – II

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems,ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

Unit – III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Unit – IV

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Unit – V

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbots and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley Getting Started with the Internet of Things, CunoPfister ,Oreilly
2. IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO, Pearson, 2018.
3. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc18_cs46/preview
2. <https://swayam.gov.in/courses/public?keyword=Introduction%20to%20internet%20of%20things>
3. <https://swayam.gov.in/courses/public?keyword=Design%20for%20internet%20of%20things>
4. <https://www.coursera.org/specializations/iot>

MACHINE LEARNING Common to CSE&IT

VISemester
Course Code:201CS6T01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Outline the Concepts of Machine Learning and Statistical Learning
- CO2:** Build Regression and Classification models for given data
- CO3:** Make use of ensemble learning techniques to improve the performance of a model
- CO4:** Apply clustering techniques on high dimensional data to group the similar entities
- CO5:** Implement neural network models using keras and tensor flow libraries

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	1	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	2	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit – I

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training

and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit – II

Supervised Learning(Regression/Classification): Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

Unit – III

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification, SVM Regression, Naïve Bayes Classifiers.

Unit – IV

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit – V

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaishman, 25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'reilly

Web Links:

1. <https://www.deeplearning.ai/machine-learningyearning/>
2. <https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. <https://www.udemy.com/course/machinelearning/>

COMPILER DESIGN

Common to CSE&IT

VISemester
Course Code:201CS6T02

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Analyze the phases in compilation process.
- CO2:** Apply different parsing algorithms to develop parsers for a given grammar.
- CO3:** Construct various forms of intermediate code.
- CO4:** Compare the storage allocation strategies.
- CO5:** Apply techniques to generate optimized and target code.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	1	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	1	-

Unit – I

Overview of Language Processing:Language Processors,Structure of a Compiler. Lexical Analysis:The Role of the Lexical Analyzer - Lexical Analysis Vs. Parsing,Tokens, Patterns and Lexemes, Lexical Errors, Regular Expressions, Regular Definitions, Recognition of Tokens,The Lexical-Analyzer Generator Lex.

Unit – II

Syntax Analysis: The Role of the Parser, Context Free Grammars- Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, Classification of Parsing Techniques Top-Down Parsing: Brute-Force Parsing, Recursive-Descent Parsing, First and Follow,LL(1) Grammars,Nonrecursive Predictive Parsing, Error Recovery in Predictive Parsing.

Unit – III

Bottom-Up Parsing: Reductions, Handle Pruning, Shift-Reduce Parsing, Why LR Parsers, The LR-Parsing Algorithm,Constructing SLR-Parsing Tables, More Powerful LR Parses - Construction of CLR(1), LALR Parsing Tables, Using Ambiguous Grammars.

Unit – IV

Semantic Analysis: Syntax-Directed Definitions, Evaluation Orders for SDD's, Syntax Directed Translation. Intermediate Code Generation:Three Address Code – Addresses and Instructions,Quadruples, Triples, Abstract Syntax Trees, Type Checker - Type Expressions,Type Conversion. Runtime Environments: Storage Organization, Stack Allocation of Space, Storage Allocation Strategies– Static Allocation, Stack Allocation and Heap Allocation.

Unit – V

Code Optimization: Basic Blocks & Flow Graphs, Machine-Independent Optimizations – The Principal Sources of Optimization: Common Subexpression Elimination, Copy Propagation, Dead-Code Elimination, Code Motion, Induction Variables and Reduction in Strength,DAG Representation. Code Generation: Issues in the Design of a Code Generator, Object Code Forms, A Simple Code Generator, Machine-dependent Optimizations:Peephole Optimization, Register Allocation and Assignment.

Text Books:

1. Compilers: Principles, Techniques and Tools, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Second Edition, Pearson,2007.
2. Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning, 2006.

Reference Books:

1. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
2. Principles of Compiler Design,Nandhini Prasad, K.S,3rd Edition, CENGAGE.
3. Compiler Design,K.Muneeswaran, OXFORD.

Web Links:

1. <https://nptel.ac.in/courses/106/108/106108113/>
2. <https://nptel.ac.in/courses/106/104/106104123/>
3. <https://nptel.ac.in/courses/106/104/106104072/>
4. <http://www.cse.iitd.ernet.in/~sak/courses/cdp/slides.pdf>
5. <https://in.udacity.com/course/compilers-theory-and-practice--ud168>

CRYPTOGRAPHY AND NETWORK SECURITY
Common to CSE&IT

VISemester
Course Code:201CS6T03

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Demonstrate the fundamentals of network security and cryptography mathematics.
- CO2:** Classify the symmetric key encryption and decryption algorithms.
- CO3:** Apply public key cryptographic techniques for data security.
- CO4:** Apply cryptographic hash functions and digital signature to ensure data integrity
- CO5:** Describe the security protocols in network, transport and application layers.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	1	-	-	-	-
CO2	2	2	-	1	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	1	-	-	-	1	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	1
CO3	2	1
CO4	2	1
CO5	1	-

Unit – I

Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography (Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence).

Unit – II

Symmetric Encryption: Traditional Symmetric Key Ciphers (Introduction, Substitution ciphers, Transposition ciphers, Stream and block ciphers), Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

Unit – III

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography (Euler's Phi Function, Fermat's Little Theorem, Euler's Theorem, Chinese Remainder Theorem), Asymmetric Key Cryptography(Introduction, RSA Cryptography, Rabin Cryptosystem, Elgamal Cryptosystem)

Unit – IV

Data Integrity, Digital Signature Schemes & Key Management: Message Integrity and Message Authentication, Cryptographic Hash Functions (SHA-512), Digital Signature (Comparison, Process, Services, Attacks), Key Management (Symmetric Key Distribution, Kerberos, X.509).

Unit – V

Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, Network Security-II : Security at the Network Layer: IPSec (Modes, Security Protocols, Security Association, Security Policy)

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography: Fundamental Principles and Applications, Keith M.Martin, Oxford publications, Second edition.

Reference Books:

1. Network Security and Cryptography, Bernard Menezes, Cengage Learning, First edition.
2. Cryptography and Network Security by AtulKahate, Tata McGraw-Hill, Second Edition.

Web Links:

1. <https://nptel.ac.in/courses/106105031>
2. <https://nptel.ac.in/courses/106105162>
3. <https://users.cs.northwestern.edu/~ychen/classes/cs395-w05/lectures.html>
4. <https://ocw.mit.edu/courses/6-875-cryptography-and-cryptanalysis-spring-2005/>

BIG DATA ANALYTICS
(Professional Elective-II)
Common to CSE & IT

VISemester
Course Code:201CS6E01

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate big data challenges in different domains.
- CO2:** Use various techniques for mining data stream.
- CO3:** Demonstrate Building blocks of Hadoop.
- CO4:** Choose map reduce approach to solve big data Problems.
- CO5:** Make use of Pig and Hive to structure and work with big Data.
- CO6:** Make use of Spark tool to work with big data.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	2	-	-	-	-	-	-	-
CO2	2	3	-	1	2	-	-	-	-	-	-	-
CO3	2	1	-	3	2	-	-	-	-	-	-	-
CO4	3	2	-	2	2	-	-	-	-	-	-	-
CO5	2	3	-	2	2	-	-	-	-	-	-	-
CO6	2	2	-	1	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

Unit – I

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

Unit – II

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications.

Unit – III

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

Unit – IV

Pig: Hadoop Programming Made Easier: Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Checking out the Pig Script Interfaces, Scripting with Pig Latin. Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works with examples, Querying and Analyzing Data.

Unit – V

Spark: Installing Spark, Spark applications, Jobs, stages and Tasks, Resilient Distributed data sets, Shared Variables, Anatomy of a Spark job run.

Text Books:

1. Hadoop: The Definitive Guide, Tom White, 4 th Edition, O'reilly, 2012.
2. Hadoop for Dummies, Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, BruceBrown, RafaelCoss, John Wiley & Sons, 2014.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", CUP, 2012

Reference Books:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
2. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
3. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
4. Learning Spark: Lightning Fast Big Data Analysis Paperback, Holden Karau

Web Links:

1. Hadoop: <http://hadoop.apache.org/>
2. Hive: <https://cwiki.apache.org/confluence/display/Hive/Home>
3. <http://nptel.ac.in/courses/106106142/>
4. <https://hortonworks.com/tutorial/how-to-process-data-with-apache-hive/>
5. <https://databricks.com/spark/getting-started-with-apache-spark>

MOBILE COMPUTING (Professional Elective-II)

VI Semester

Course Code: 201CS6E02

L	T	P	C
3	0	0	3

Course Outcomes:**At the end of the Course, Student will be able to:**

- CO1:** Describe the fundamental concepts of Mobile Computing, Adhoc network and GSM Architecture
- CO2:** Discuss the importance of MAC and Mobile IP
- CO3:** Compare Traditional TCP and Modified TCP
- CO4:** Summarize the database issues, Data Dissemination and Synchronization in mobile environment
- CO5:** Identify the various protocol & platforms for mobile computing
- CO6:** Illustrate various applications of mobile computing.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	3	1	2	2	-	-	-	-	-	-	-	2
CO3	1	2	2	3	-	-	-	-	-	-	-	-
CO4	3	2	2	-	2	-	1	-	-	-	-	1
CO5	3	2	2	-	2	-	-	-	-	-	-	1
CO6	3	1	-	2	-	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit – I

Mobile Communications: Mobile Communication, Mobile Computing:– Novel Applications, Limitations of Mobile Computing, Mobile Computing Architecture, Mobile Devices, Handheld Devices, Limitations of Mobile Devices. GSM–Services, System Architecture, Radio Interfaces of GSM, Protocols of GSM, Localization, Call Handling, Handover, Security, New Data Services, General Packet Radio Service.

Unit – II

Medium Access Control (MAC): Motivation for a specialized MAC: Hidden and exposed terminals, near and far terminals, SDMA, FDMA, TDMA and CDMA. Mobile Network Layer: Mobile IP: Goals, assumptions and requirements, Entities and terminology, IP Packet Delivery Agent discovery, Registration, Tunnelling and encapsulation, Optimizations, Reverse tunnelling, Dynamic Host Configuration Protocol

Unit – III

Mobile Transport Layer: Traditional TCP, Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/timeout freezing, Selective retransmission, Transaction oriented TCP. Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation.

Unit – IV

Data Dissemination: Communication Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing techniques. Data Synchronization: – Synchronization, Synchronization Software, Synchronization Protocols.

Unit – V

Mobile Ad hoc Networks: Introduction to Mobile Ad-hoc Network, MANET:Properties, Applications, Routing and Routing Algorithms (Algorithms such as DSR, AODV, DSDV, etc.), Mobile Agent, Service Discovery. Protocols & Platforms for Mobile Computing: WAP, Bluetooth-enabled Devices Network, XML, J2ME, JavaCard, PalmOS, Windows CE, Symbian OS, Android.

Text Books:

1. Mobile Communications, Jochen H. Schiller, 2ndEdition, Pearson
2. Mobile Computing, Raj Kamal, 2ndEdition, Oxford University Press

Reference Books:

1. Mobile Computing, Technology Applications and Service Creation, Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, 2ndEdition, McGraw Hill.
2. Handbook of Wireless Networks and Mobile Computing, Ivan Stojmenovic, Wiley.

Web Links:

1. <https://www.coursera.org/browse/computer-science>
2. <https://www.tutorialspoint.com/gsm>
3. https://sgar91.files.wordpress.com/2011/10/mobile_communications_schiller_2e.pdf
4. <https://www.sciencedirect.com/science/article/pii/S1877050915019882>
5. <http://www.dauniv.ac.in/downloads/Mobilecomputing/MobileCompChap06L01UD>

OBJECT ORIENTED ANALYSIS AND DESIGN
(Professional Elective-II)
Common to CSE & IT

VISemester
Course Code:201CS6E03

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Apply Object Oriented concepts in software design.
- CO2:** Construct appropriate model for a given requirements.
- CO3:** Apply behavioural modelling techniques for effective software system design.
- CO4:** Build advanced deliverable model for an application
- CO5:** Construct efficient architectural model for software systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	1	-	-	-	-	-	-	-
CO2	2	2	2	-	2	-	-	-	-	-	-	-
CO3	2	1	3	-	2	-	-	-	-	-	-	-
CO4	2	-	2	-	2	-	-	-	-	-	-	-
CO5	2	2	3	1	2	-	-	-	1	1	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	2	-

Unit – I

Introduction to UML: The Structure of Complex systems, Attributes of Complex System, why we model, Conceptual model of UML, Architecture.

Classes: Classes, Relationships, Common Mechanisms, Class diagrams, Nature of a Class, Relationship among Classes

Unit – II

Objects: Nature of object, Evolution of Object Model, Elements of Object Model, Relationships among objects, Object diagrams, Interplay of Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

Unit – III

Basic Behavioral Modeling: Use cases, Use case Diagrams, Interactions, Interaction diagrams, Activity Diagrams.

Unit – IV

Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams

Unit – V

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Case Study: The Unified Library application

Text Books:

1. The unified Modeling language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning

Reference Books:

1. Object Oriented Analysis and Design, Satzinger, CENGAGE
2. A Magnifying object-oriented analysis and design by ArpitaPatil and Netra, PHI
3. Head first object-oriented analysis and design, Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly.
4. Object-oriented analysis and design using UML, Mahesh P. Matha, PHI

Web Links:

1. https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.html
2. <https://repository.genmymodel.com/okasha/udacity>
3. <https://www.coursera.org/learn/object-oriented-design/lecture/6GJtg/1-1-3object - oriented-modeling>
4. <https://www.geeksforgeeks.org/unified-modeling-language-uml>
5. <https://www.quora.com/in/What-are-the-best-website-to-study-UML-for- beginners>.

NETWORK PROGRAMMING
(Professional Elective-II)
Common to CSE & IT

VISemester
Course Code:201CS6E04

L T P C
3 0 0 3

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Explain the concepts of TCP and UDP connection establishments.
- CO2:** Demonstrate TCP echo server functions and working.
- CO3:** Illustrate different socket options available for I/O multiplexing.
- CO4:** Utilize name and address conversion operations of UDP
- CO5:** Apply concept of Pipes, FIFO for inter process communication.
- CO6:** Make use of Semaphores and Message Queues for inter process communication.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	3	-	-	-	-	-	-	-	-
CO2	2	1	2	3	-	-	-	-	-	-	-	-
CO3	2	1	3	2	-	-	-	-	-	-	-	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO6	2	3	-	-	3	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit – I

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets : Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

Unit – II

TCP client server : Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

Unit – III

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.

Unit – IV

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Unit – V

IPC : Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores.

Text Books:

1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

Reference Books:

1. UNIX SYSTEMS PROGRAMMING USING C++ T CHAN, PHI.
2. UNIX for programmers and Users, 3RD Edition, GRAHAM GLASS, KING ABLES, Pearson Education.
3. Advanced UNIX programming, 2nd edition, M J Rochkind pearson education

Web Links:

1. <https://www.udemy.com/course/network-programming-from-scratch/>
2. <https://www.udemy.com/course/tcp-ip-training/>
3. <https://www.udemy.com/course/tcpmasterclass/>
4. <https://www.udemy.com/course/learn-socket-programming-in-c-from-scratch/>

REPAIR AND REHABILITATION OF STRUCTURES
(Open Elective-II)

VI Semester
Course Code: 201CE6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures
- CO2: Conduct field monitoring and non-destructive evaluation of concrete structures.
- CO3: Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
- CO4: Understand the methods of strengthening methods for concrete structures
- CO5: Evaluation of actual capacity of the concrete structure Maintenance strategies

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Deterioration of concrete structures: Introduction, Basic terminology – Causes of deterioration, Physically induced deterioration, Chemically induced deterioration, Distress – Identification, Repair management

Unit - II

Failure of buildings: Types of failures – Causes of mechanisms of failures, Methodology for investigation of failures – Diagnostic methods, Concrete behaviour under corrosion, Thermal effects & Moisture effects.

Unit - III

Investigation & Evaluation methods: Damage testing, Preliminary inspection and its stages, Visual investigation, Non – Destructive testing methods – Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance & Pullout tests, Corrosion: Methods for corrosion measure & assessment, Depth of carbonation.

Unit - IV

Repair and Rehabilitation Techniques: Repair: Gunning, Shotcreting, Epoxy – Cement mortar injection, Crack ceiling Rehabilitation Methods: Grouting, Imbalance of structural stability, Strengthening & Stabilization techniques, Design consideration – Beam shear capacity strengthening – Shear transfer strengthening – Stress reduction techniques – Column strengthening, Flexural strengthening – Connection stabilization & strengthening.

Unit – V

Seismic Retrofitting:Introduction-Consideration in Retrofitting of structures, Sources of weakness in RC frame building, Retrofitting strategies for RC buildings – Global retrofitting techniques, Local retrofitting techniques. Case studies: Related to rehabilitation of bridges piers, Heritage structures,Dam.

Text Books:

1. Maintenance Repair Rehabilitation & Minor works of Buildings- P.C. Varghese, PHI Publications
2. Rehabilitation of Concrete Structures-B.Vidivelli,Standard Publishers Distributors
3. Concrete Bridge Practice Construction Maintenance & Rehabilitation- V.K. Raina, Shroff Publishers and Distributors.

Reference Books:

1. Concrete Technology Theory and Practice-M.S.Shetty,SChandandCompany
2. Concrete Repair and Maintenance illustrated-Peter HEmmons
3. Concrete Chemical Theory and Applications- Santa Kumar A.R. , Indian Society for Construction Engineering and Technology, Madras

Web Links:

1. https://www.academia.edu/30633495/Repair_and_Rehabilitation_of_Structures
2. <https://nptel.ac.in/courses/105/106/105106202/>
3. <https://www.vidyarthiplus.com/vp/Thread-CE2071-Repair-and-Rehabilitation-of-Structures-Lecture-Notes>

INDUSTRIAL WASTE WATER MANAGEMENT
(Open Elective-II)

VI Semester
Course Code: 201CE6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
- CO2: Illustrate various treatment methods based on characteristics of waste water
- CO3: Suggest treatment methods for any industrial wastewater.
- CO4: Decide the need of common effluent treatment plant for the industrial area in their vicinity
- CO5: Explain the treatment methods of liquid waste from various industries.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Industrial water Quantity and Quality requirements:

Boiler and cooling waters—Process water for Textiles, Food processing, Brewery Industries, power plants, fertilizers, sugar mills.

Unit – II

Miscellaneous Treatment:

Use of Municipal wastewater in Industries – Advanced water treatment – Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, elutriation, Removal of Iron and Manganese, Removal of Colour and Odour

Unit – III

Basic theories of Industrial Wastewater Management:

Industrial waste survey – Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis – Wastewater Characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-Volume and Strength reduction – Neutralization – Equalization and proportioning- recycling, reuse, and resources recovery.

Unit – IV

Industrial wastewater disposal management:

Discharges into Streams, Lakes and oceans and associated problems, Land treatment – Common Effluent Treatment Plants: advantages and suitability, Limitations, and challenges- Recirculation of Industrial Wastes-Effluent Disposal Method

Unit – V

Process and Treatment of specific Industries:

Manufacturing Process and origin, characteristics, effects, and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants.

Text Books:

1. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi, 2016
2. Industrial Wastewater Treatment by KVSG Murali Krishna.
3. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition.

Reference Books:

1. Industrial Water Pollution Control by W. Wesley Eckefelder, Mc- GrawHill, Third Edition, 2015
2. Wastewater Treatment- Concepts and Design Approach by G.L. Karia & R.A. Christian, Prentice Hall of India
3. EnviroUnit Operations and Processes in Environmental Engineering by Reynolds. Richard, Cengage Learning

Web Links:

1. <https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce32/>
2. <https://www.un-ihe.org/online-course-industrial-effluent-treatment>
3. <https://www.owp.csus.edu/courses/wastewater/industrial-waste-treatment-vol-i.php>

ROADWAYS, RAILWAYS & AIRWAYS (Open Elective-II)

VI Semester
Course Code: 201CE6O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain factors affecting pavements.
- CO2: Explain materials used for pavement
- CO3: Explain recycling techniques used for pavement.
- CO4: Explain the basic concepts of railway.
- CO5: Explain the basic concepts of airport engineering.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Highway and airport pavements, Types and component parts of pavements, their differences - Factors affecting design and performance of pavements Road making materials: classification, testing and applications of road making aggregates – road binders – rheology of bituminous binders – special binders – emulsion, cut back. Cement

Unit – II

Use of Geosynthetics in Highway Construction: Functions and applications of Geosynthetics in highway embankment, slopes, new pavements and overlays. Types, manufacturing and Testing of geosynthetics along with specifications. Economic aspects.

Unit – III

Recent Developments: Utilisation of waste products like fly ash, slag, marginal materials in road construction. Application of Polymers, fibre-reinforced concrete, high performance concrete. Recycling Techniques in Bituminous Pavements: Need for recycling, methods of recycling, construction controls and economics.

Unit – IV

Railway Engineering: Railway track gauge; alignment of railway lines; geometric design of track; track junctions and track layouts; track maintenance, drainage; level crossings; locomotives and other rolling stock; railway sections and yards; signalling and interlocking

Unit – V

Airport Engineering: Aircraft characteristics; airport planning; airport site selection; classification of obstructions; air traffic control
Airport Characteristics: airfield capacity; runway design; taxiway design; holding aprons; runway lighting and markings; passenger terminal area; runway pavement design; airport drainage.

Text Books:

1. Khanna and Justo, "Test Book of Highway Engineering"- Nemchand brothers, Roorke- 2017
2. Saxena, S. C., and Arora, S. P., Railway Engineering, Dhanpat Rai & Sons, New Delhi, India, 2017
3. Khanna, S. K., Arora, M. G., and SS Jain, Airport Planning and Design, Nem Chand & Bros., Roorkee, India, 2019.

Reference Books:

1. Yoder, E.J., and Witczak, "Principles of Pavement Design"- 2nd ed. John Wiley and Sons, 1975.
2. Highway Engineering, S.P.Bindra, Dhanpatrai & Sons., 4th Edition 2008.
3. Railway engineering by Rangawala, 2017.

Web Links:

1. <https://nptel.ac.in/courses/105/105/105105176/>
2. <https://nptel.ac.in/courses/105/101/105101083/>
3. <https://nptel.ac.in/courses/105/108/105108069/>

INDUCTION AND SYNCHRONOUS MACHINES
(Open Elective-II)

VI Semester
Course Code: 201EE6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the operation of single phase and three phase induction motors.
- CO2: Analyze the performance of induction motors and induction generator.
- CO3: Apply the methods of starting and speed control of Three phase Induction Motors.
- CO4: Analyze the performance of synchronous generator.
- CO5: Analyze the Parallel operation of synchronous generators.
- CO6: Explain hunting phenomenon, implement methods of starting and correction of power factor with synchronous motor.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Three Phase Induction Motors: Construction details of cage and wound rotor machines -production of rotating magnetic field - principle of operation - rotor emf and rotor frequency - rotor current and pf at standstill and during running conditions - rotor power input, rotor copper loss and mechanical power developed and their interrelationship –equivalent circuit – phasor diagram. Torque equation - expressions for maximum torque and starting torque - torque slip characteristic - double cage and deep bar rotors – crawling and cogging

Unit - II

Starting And Testing of Induction Motors: Speed control of induction motor with V/f method – no load and blocked rotor tests - circle diagram for predetermination of performance– methods of starting – starting current and torque calculations – induction generator operation (Qualitative treatment only). Single phase induction motors –Constructional features and equivalent circuit - Problem of starting–Double revolving field theory–Starting methods. Shaded pole motors, AC Series motor.

Unit - III

Construction, Operation and Voltage Regulation of Synchronous generator: Constructional features of non-salient and salient pole type – Armature windings – Distributed and concentrated windings – Distribution–Pitch and winding factors –

E.M.F equation–Improvements of waveform and armature reaction–Voltage regulation by synchronous impedance method– MMF method and Potier triangle method–Phasor diagrams– Two reaction analysis of salient pole machines and phasor diagram.

Unit – IV

Parallel Operation of Synchronous Generators: Parallel operation with infinite bus and other alternators – Synchronizing power – Load sharing– Control of real and reactive power– Numerical problems.

Unit – V

Synchronous Motor – Operation, Starting and Performance: Principle and theory of operation– Phasor diagram – Starting torque– Variation of current and power factor with excitation –Synchronous condenser – Mathematical analysis for power developed–Hunting and its suppression – Methods of starting – Applications.

Text Books:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers, 7th edition, 2011
2. Electrical Machines by R.K. Rajput, Lakshmi publications, 5th edition Company, 4th edition, 1997.

Reference Books:

1. Electrical Machines by D. P. Kothari, I. J. Nagarkar, McGraw Hill Publications, 4th edition, 2010.
2. Electric Machinery by A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans, TMH, 6th edition, 2003.
3. Electrical Machinery by Abijith Chakrabarti and Sudipta Debnath, McGraw Hill, 1st edition.

Web Links:

1. <https://nptel.ac.in/courses/108/105/108105131/>
2. <https://www.electrical4u.com/parallel-operation-of-alternator/>

NON-CONVENTIONAL ENERGY RESOURCES
(Open Elective-II)

VI Semester
Course Code: 201EE6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1 Interpret renewable energy sources and solar radiation.
- CO2 Design solar photo voltaic systems.
- CO3 Discuss the working principles of wind energy conversion systems.
- CO4 Illustrate the techniques and conversion principles of hydro energy resources.
- CO5 Illustrate the techniques and conversion principles of tidal energy resources.
- CO6 Explain basic principles and working of biomass and geothermal systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	2	-	-	1	-	-	-	-	-
CO2	2	2	3	1	-	-	1	-	-	-	-	-
CO3	3	2	2	-	-	-	1	-	-	-	-	-
CO4	3	2	2	-	-	-	1	-	-	-	-	-
CO5	2	3	2	-	-	-	1	-	-	-	-	-
CO6	2	3	2	-	-	-	1	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	2
CO2	1	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6		2

Unit - I

Fundamentals of Energy Systems and Solar energy: Renewable and non-renewable energy sources, energy consumption as a measure of Nation's development; strategy for meeting the future energy requirements Global and National scenarios, Prospects of renewable energy sources. Impact of renewable energy generation on environment, Kyoto Protocol, Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces.

Unit - II

Solar Photovoltaic Systems: Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System design: storage sizing – PV system sizing – Maximum power point tracking.

Unit - III

Wind Energy: Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip-speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

Unit – IV

Hydro and Tidal power systems: Hydro: Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal: – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators.

Unit – V

Biomass and geothermal systems: Biomass Energy: Processes, Different digesters and sizing. Geothermal: Classification – Dry rock and hot aquifer – Potential in India – Geothermal based electric power generation

Text Books:

1. Non-Conventional energy resources, Khan B.H, Tata Mc-Graw hill, New Delhi, 3rd edition.
2. Non-conventional Energy Sources, G.D.Rai, Khanna Publications, New Delhi, 4th edition.

Reference Books:

1. Renewable energy resources, Twidell, J.W. and Weir, A., BSP Books Pvt.Ltd, UK, 2nd edition.
2. Non-Conventional Energy, Ashok V.Desai, New Age International Publications, Tokyo, 1st edition.
3. Renewable Energy Technologies, R.Ramesh, Uday kumar, Narosa Publishing House, New Delhi, 1st edition.

Web Links:

1. <https://nptel.ac.in/courses/121/106/121106014/>
2. <https://nptel.ac.in/courses/108/108/108108078/>
3. <https://nptel.ac.in/courses/103/103/103103206/>

ENERGY AUDIT, CONSERVATION & MANAGEMENT
(Open Elective-II)

VI Semester
Course Code: 201EE6O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1 Explain energy efficiency, conservation and various technologies.
- CO2 Design energy efficient lighting systems.
- CO3 Calculate power factor of systems and proposes suitable compensation techniques.
- CO4 Explain energy conservation in HVAC systems.
- CO5 Calculate lifecycle costing analysis and return on investment on energy efficient technologies.
- CO6 Calculate the Time value of Money

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	-	-	-	-	-	-	-	-	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-
CO3	2	3	1	-	-	-	-	-	-	-	-	-
CO4	2	3	1	-	-	-	-	-	-	-	-	-
CO5	1	2	1	-	-	-	-	-	-	-	-	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	1	-

Unit - I

Basic Principles of Energy Audit: Energy audit- definitions - concept - types of audit - energy index - cost index - pie charts - Sankey diagrams and load profiles - Energy conservation schemes- Energy audit of industries- energy saving potential - energy audit of process industry - thermal power station - building energy audit - Conservation of Energy Building Codes (ECBC-2017) -

Unit - II

Energy Management : Principles of energy management - organizing energy management program - initiating - planning - controlling - promoting - monitoring - reporting. Energy manager - qualities and functions - language - Questionnaire – check list for top management.

Unit - III

Energy Efficient Motors and Lighting: Energy efficient motors - factors affecting efficiency - loss distribution - constructional details - characteristics – variable speed - RMS - voltage variation-voltage unbalance-over motoring-motor energy audit. lighting system design and practice - lighting control - lighting energy audit.

Unit – IV

Power Factor Improvement And Energy Instruments: Power factor – methods of improvement - location of capacitors - Power factor with non-linear loads - effect of harmonics on p.f - p.f motor controllers – Energy Instruments- watt meter - data loggers - thermocouples - pyrometers - lux meters - tongue testers.

Unit – V

Economic Aspects and Their Computation: Economics Analysis depreciation Methods - time value of money - rate of return - present worth method - replacement analysis - lifecycle costing analysis – Energy efficient motors. Calculation of simple payback method - net present value method- Power factor correction - lighting – Applications of life cycle costing analysis - return on investment.

Text Books:

1. Energy management by W.R.Murphy&G.Mckay Butter worth - Heinemann publications - 1982.
2. Energy management hand book by W.CTurner - John wiley and sons - 1982.

Reference Books:

1. Energy efficient electric motors by John.C.Andreas - Marcel Dekker Inc Ltd-2nd edition - 1995
2. Energy management by Paul o' Callaghan - Mc-graw Hill Book company-1st edition - 1998
3. Energy management and good lighting practice : fuel efficiency- booklet12-EEO

Web Links:

1. <https://nptel.ac.in/courses/108106022/>
2. <https://nptel.ac.in/courses/112105221/>
3. https://onlinecourses.nptel.ac.in/noc17_mm17/preview

SOLAR ENERGY UTILISATION (Open Elective-II)

VI Semester
Course Code: 201ME6001

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the concept of solar radiation and its measurement.
- CO2: Describe the working principle of different types of collectors and its types
- CO3: Explain the various solar thermal energy technologies and their applications
- CO4: Analyze the various solar PV cell materials and conversion techniques.
- CO5: Apply solar passive building techniques for cooling and heating applications.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Solar Radiation and its measurement:

Solar angles, Sun path diagrams, Radiation, extraterrestrial characteristics, Solar energy measuring instruments-Pyranometer, Pyrheliometer & Sun shine recorder. Estimation of average solar radiation on horizontal and tilted surfaces.

Unit – II

Solar Collectors for Industrial process heat:

Flat plate collector, Materials for flat plate collector and their properties, evacuated tubular collectors. Concentrator collectors-classification, compound parabolic concentrators, parabolic trough concentrators, concentrators with point focus, tracking systems, Heliostats

Unit – III

Solar Thermal Technologies:

Principle of working, types, design and operation of solar heating and cooling systems. Thermal Energy storage systems-Solar Desalination, Solar cooker: domestic, community, Solar pond, Solar drying, Solar chimney, Solar water disinfection (SODIS) & Solar furnaces.

Unit – IV

Solar Cells:

Semi-conductor materials, Doping, PN junction and characteristics, Photo-voltaic effect, Photo-voltaic material, Parameters of solar cells, Effects of cell temperature on cell efficiency, Types of solar cells, Solar modules and arrays, Solar cell power plant, Silicon, thin film and polymer processing, Silicon wafer based solar cells.

Unit – V**Solar Passive Architecture:**

Thermal comfort, bio-climatic classification, passive heating concepts: direct heat gain, indirect heat gain, isolated gain and sunspaces. Passive cooling concepts: evaporative cooling, radiative cooling, shading - paints and cavity walls for cooling, roof radiation traps, thermal comfort.

Text Books:

1. Sukhatme S P,Nayak J K, "Solar Energy", TataMcGraw Hill,4th Edition,
2. Tiwari G N,Solar Energy, "Fundamentals Design,Modeling and Applications", Narosa, New Delhi., 5th Edition

Reference Books:

1. D.Yogi Goswami, "Principles of Solar Engineering", CRC Press, Taylor and Francis group, New York, 3rd Edition.
2. Duffie.J.A and Beckman.W.A, "Solar Engineering of Thermal Process", Wiley, Canada, 4rd Edition
3. GargHP,PrakashS ,Solar Energy:Fundamentals and Application,TataMcGrawHill, 1st edition
4. David A.Bainbridge,Ken Haggard,Kenneth L.Haggard,Passive Solar Architecture: Heating, Cooling, Ventilation, Daylighting, and More Using Natural Flows,Chelsea Green Publishing, 1st edition

Web Links:

1. <https://nptel.ac.in/courses/112/105/112105051/>
2. <https://www.youtube.com/watch?v=mCgXsEyQZSI>
3. <https://nptel.ac.in/courses/115103123>
4. <https://nptel.ac.in/courses/115107116>

BASIC THERMODYNAMICS AND HEAT TRANSFER
(Open Elective-II)

VI Semester
Course Code: 201ME6002

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the basic thermodynamic concepts and laws of thermodynamics.
- CO2: Apply the laws of thermodynamic for energy system.
- CO3: Analyze the properties of pure substance and gas mixture.
- CO4: Explain the basic concepts of thermodynamic cycles.
- CO5: Analyze basic heat transfer mechanisms.
- CO6: Evaluate the performance of heat exchangers.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-
CO5	3	1	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

Unit - I

BASIC CONCEPTS OF THERMODYNAMICS:

Introduction, Macroscopic and Microscopic Viewpoint, Thermodynamic Equilibrium, State, property, process, cycle, Reversibility, Quasi static process, irreversible process, heat and work transfer, point and path function. Zeroth law of Thermodynamics Concept of temperature principles of thermometry, reference points, constant volume gas thermometer, Scales of temperature, ideal gas scale.

Laws of Thermodynamics: First law of thermodynamics, PMM-I, Corollaries- First law applied to a Process, applied to a system, Steady Flow Energy Equation, Limitations of first law of thermodynamics, thermal reservoir, heat engine, heat pump, Second law of thermodynamics - Kelvin Planck and Clausius statements and their equivalence, PMM-II, Clausius inequality, Entropy, principle of entropy increase, energy equation, Third law of thermodynamics.

Unit - II

PROPERTIES OF PURE SUBSTANCE AND GAS MIXTURE:

Properties of Pure Substances: Pure substance, P-V-T surfaces, T-S & h-S diagrams, Mollier chart, phase transformations, triple point, at critical state properties during the change of phase, dryness fraction.

Properties of Gas Mixtures: Mixture of perfect gases, mole fraction, mass fraction, gravimetric & volumetric analysis, Dalton's law of partial pressure, Avogadro's law of additive volumes, equivalent gas constant, molecular internal energy, enthalpy of specific heats and entropy of mixture of perfect gasses, vapor, and atmospheric air.

Unit – III**THERMODYNAMIC CYCLES:**

Air standard cycles- Otto Cycle, Diesel Cycle & Dual Cycle. Vapour power cycles-Carnot cycle, Rankine cycle, reheat cycle, regenerative cycle. Refrigeration cycles- Bell Coleman cycle, Vapor Refrigeration cycles Description and representation on P-V and T-S diagram, Thermal Efficiency; Mean effective pressures on Air standard basis – Comparison of Cycles.

Unit – IV**HEAT TRANSFER BASICS:**

Mode and mechanism of heat transfer, thermal conductivity, Fourier's law, thermal contact resistance, thermal resistance network for plane wall and multilayer plane walls. Equivalent resistance, overall heat transfer coefficient. Heat conduction in cylinders and spheres, critical thickness of insulation. Fundamentals of thermal radiation, Stefan Boltzmann's law.

Unit – V**HEAT EXCHANGER:**

Type of heat exchangers, Analysis of parallel flow and counter flow heat exchanger, Effect of fouling on the overall heat transfer coefficient, the log mean temperature difference method, The effectiveness-NTU method.

Text Books:

1. Engineering Thermodynamics – P.K. Nag/ McGraw Hill Education/ Sixth edition. 2017.
2. Fundamentals of Engineering Heat and Mass Transfer - R.C. Sachdeva/ New Age Internationals; First Edition 2017

Reference Books:

1. Heat and Mass Transfer: P.K. Nag/ McGraw Hill / Third edition 2011.
2. Thermodynamics: An Engineering Approach (SIE) – Yunus A Cengel; Michael A Boles/ McGraw Hill Education/ Eighth edition 2015
3. Heat and Mass Transfer – Fundamentals and Applications/ Yunus A Cengel; Afshin J Ghajar/ McGraw Hill/ Sixth edition 2020.
4. A Textbook of Heat and Mass Transfer – R. K. Rajput/ S. Chand Publishing/ Seventh edition. 2018.

Web Links:

1. <https://web.mit.edu/16.unified/www/FALL/thermodynamics/thermo.pdf>
2. <https://nptel.ac.in/courses/112108148>
3. <https://nptel.ac.in/courses/112108149>
4. <https://ahtt.mit.edu/wp-content/uploads/2019/08/AHTTv500.pdf>

INTRODUCTION TO HYDRAULICS & PNEUMATICS
(Open Elective-II)

VI Semester
Course Code: 201ME6003

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Describe the fundamentals of fluid power systems.
- CO2: Illustrate the working of fluid power actuators and hydraulic motors.
- CO3: Identify the working of Hydraulic Components.
- CO4: Analyze the concepts of hydraulic circuits.
- CO5: Explain the working of pneumatic systems.
- CO6: Examine the concepts of pneumatic circuits.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	-	1	-	-	-	1	-	-	-	-	-
CO2	3	-	1	-	-	-	-	-	-	-	-	-
CO3	3	-	1	-	-	-	2	-	-	-	-	-
CO4	3	-	2	-	-	-	2	-	-	-	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	-
CO6	3	-	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	2
CO2	-	2
CO3	-	1
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Fundamentals of Fluid Power Systems:

Introduction, Types, Advantages, Disadvantages and Applications, Fluid Characteristics, Terminologies used in Fluid Power, Hydraulic Symbols, Hydraulic Systems and Components, Sources Pumping Theory, Gear, Vane & Piston Pumps.

Unit – II

Fluid Power Actuators:

Introduction, Hydraulic Actuators, Hydraulic Cylinders Types, Construction, Specifications and Special Types.

Hydraulic Motors:

Working Principle, Selection Criteria for Various Types, Hydraulic Motors in Circuits, Formulae, Numerical Problems.

Hydraulic components:

Introduction, Control Elements, Direction Control Valve, Check Valve, Pressure Control Valve, Relief Valve Throttle Valve, Temperature and Pressure Compensation, Locations of Flow Control Valve

Unit – III

Accumulators and Intensifiers: Types, Size and function of accumulator's application and circuits of Accumulators. Intensifiers, Circuit and Applications. Design and Drawing of Hydraulic Circuits: Introduction-case study and specifications, method of drawing a hydraulic circuit, hydraulic cylinder, quick return of a hydraulic cylinder.

Unit – IV**Pneumatic Systems:**

Introduction, symbols used, concepts and components comparison, types and specifications of compressors, arrangement of a complete pneumatic system, compressed air behavior, understanding, pneumatic circuits, and direction control valves.

Electro Pneumatics

Introduction, Pilot operated solenoid valve, electrical connections to solenoids, electro pneumatic circuit switches, relays, solenoids, P.E converter, concept of latching

Unit – V**Pneumatic circuits**

Applications, servo systems, introduction, closed loop, hydro-mechanical and electro hydraulic, conventional and proportional valves, characteristics of proportional and servo valves, PLC applications in fluid power, selected pneumatic / electro pneumatic circuit problems, failure and trouble shooting in fluid power systems.

Text Books:

1. Introduction to Hydraulics and Pneumatics, Ilango Sivaraman, PHI Publications, 3rd Edition.
2. Applied Hydraulic and Pneumatics, T. Sunder Selwyn, Anuradha publications, 5th Edition

Reference Books:

1. Oil Hydraulic Systems- Principles and Maintenance, S R Majumdar, McGraw – Hill series, 1st edition.
2. Fluid Power: Hydraulics and Pneumatics, James R Daines, Goodheart Willcox Publications, 2nd Edition
3. Principle of Hydraulic System Design, Peter Chapple, Momentum Press Engineering Publishers, 2nd Edition
4. Industrial Hydraulic Systems: Theory and Practice, Joji Parambath, Universal-Publishers, Revised Edition.

Web Links:

1. NPTEL :: Mechanical Engineering - Fluid Power Control
2. <https://nptel.ac.in/courses/112/105/112105046/>
3. <https://nptel.ac.in/content/storage2/courses/112106175/Module%201/Lecture%201.pdf>

3D PRINTING (Open Elective-II)

VI Semester
Course Code: 201ME6004

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summarize the basics of Additive manufacturing (AM) technologies.
- CO2: Explain about vat photo polymerization, material jetting and binder jetting AM technologies.
- CO3: Explain material extrusion and sheet lamination AM technologies.
- CO4: Illustrate Powder Bed Fusion and Directed Energy Deposition AM technologies.
- CO5: Apply the AM techniques in different industries
- CO6: Design and develop using additive manufacturing process.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	2	-	-	-	-	-	-	1
CO2	3	-	-	-	2	-	-	-	-	-	-	1
CO3	3	-	-	-	2	-	-	-	-	-	-	1
CO4	3	-	-	-	2	-	-	-	-	-	-	1
CO5	3	-	-	-	2	-	-	-	-	-	-	1
CO6	3	-	-	-	2	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit - I

Introduction:

Basic principle of 3D printing (3DP), need and advantages of 3DP or additive manufacturing (AM), AM Process chain - CAD Model - Input file formats - Generation and Conversion of STL file - File Verification and Repair - Build File Creation - Part Construction - Part Cleaning and finishing, Classification of additive manufacturing processes-Baseline approach, Raw material-based approach and ASTM classification, Materials used in additive manufacturing, Challenges in Additive Manufacturing.

Unit – II

VAT Photo Polymerization, Material Jetting and Binder Jetting AM technologies: Stereolithography Apparatus(SLA), ,Solid Ground Curing(SGC) , CMET's Solid Object Ultraviolet-Laser Printer (SOUP),- Working Principle, Materials, Models and specifications, Applications, Advantages and Disadvantages

Unit – III

Material Extrusion and Sheet Lamination AM technologies: Fused Deposition Modelling (FDM),Laminated Object Manufacturing (LOM), 3D Systems' Multi-Jet Modeling System (MJM), Working principle, Materials, Models and specifications Applications, Advantages and Disadvantages.

Unit – IV

Powder Bed Fusion and Direct Energy Deposition: Selective Laser Sintering (SLS), Direct Metal Laser Sintering(DMLS), Electron Beam Melting(EBM), Laser Engineered Net Shaping(LENS),Wire Arc Additive

Manufacturing(WAAM)-Working principle, Materials, Applications, Advantages and Disadvantages.

Unit – V

Additive Manufacturing -Applications:

Applications in Design, Applications in Engineering, Analysis and Planning, Applications in Manufacturing and Tooling, Aerospace Industry, Automotive Industry, Biomedical Industry, Jewelry Industry, Coin Industry, sports, electronics, food, construction and architectural, Case studies

Text Books:

1. Additive Manufacturing Technologies:3D Printing, Rapid Prototyping and Direct Digital Manufacturing, Ian Gibson, David W.Rosen, Brent Stucker, Springer, 2nd Edition
2. 3D Printing and Additive Manufacturing: Principles and Applications, Chua C.K.,and LeongK.F.,World Scientific publications, 4th Edition

Reference Books:

1. Additive Manufacturing: Principles, Technologies and Applications, C.P Paul, A.N Junoop, McGrawHill, 2021
2. Additive Manufacturing, Second Edition, Amit Bandyopadhyay Susmita Bose, CRC Press Taylor & Francis Group, 2020
3. 3D Printing Technology Fundamentals and Applications Prof H N Pandya 2021
4. Rapid Prototyping: Principles and Applications in Manufacturing, Rafiq Noorani, John Wiley & Sons, 2006

Web Links:

1. <https://www.nist.gov/additive-manufacturing>
2. <https://www.metal-am.com/>
3. <http://additivemanufacturing.com/basics/>
4. <https://www.3dprintingindustry.com/>
5. <https://www.thingiverse.com/>

ROBOTICS
(Open Elective-II)

VI Semester
Course Code: 201ME6005

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the basic concepts, parts of robots and types of robots.
- CO2: Identify various robot configuration and components,
- CO3: Select appropriate actuators and sensors for a robot based on specific application
- CO4: Explain the forward and inverse kinematics of robots.
- CO5: Explain the dynamic analysis of robots.
- CO6: Analyze the trajectory planning for a manipulator by avoiding Obstacles

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	1	-	3	-	-	-	-	-	-	-
CO2	2	1	1	-	3	-	-	-	-	-	-	-
CO3	2	2	1	-	3	-	-	-	-	-	-	-
CO4	2	2	1	-	3	-	-	-	-	-	-	-
CO5	2	2	1	-	3	-	-	-	-	-	-	-
CO6	2	2	1	-	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit - I

Automation-CAD/CAM-Robotics – An over view of Robotics – present and future applications, classification by coordinate system and control system. Applications of Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Unit – II

Components of the Industrial Robotics:Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, Grippers.

Robot Actuators and Feed Back Components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors-proximity sensors

Unit – III

Mapping and Transforms:Homogeneous transformations as applicable to rotation and translation –problems.
Manipulator Kinematics:Specifications of matrices, D-H notation joint coordinates and world coordinates
Forward and inverse kinematics – problems.

Unit – IV

Differential Motion and Dynamics:Differential transformation and manipulators, Jacobians – problems
Dynamics: Lagrange – Euler – Problems.

Unit – V

Trajectory Planning:General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

Text Books:

1. Industrial Robotics, Groover M P, Pearson Edu., 2nd Edition, 2017
2. Introduction to Robotics-Analys, Control, Applications - Saeed Niku, Wiley Publications, 2nd Edition, 2011,

Reference Books:

1. Robotics and Control, Mittal R K & Nagrath I J, Tata McGraw Hill, 2017
2. Introduction to Robotics, John J Craig, Pearson Edu., 3rd Edition, 2005
3. Robotic Engineering, Richard D. Klafter, Prentice Hall, 1989
4. Robotics, controls, sensing, vision and intelligent by Fu K S, Gonzales or Lea, Tata McGraw Hill, Indian Edition, 1987
5. Introduction To Robotics by S K Saha (IITD), Tata McGraw Hill, 2008

Web Links:

1. <https://nptel.ac.in/courses/107/106/107106090/>
2. <https://nptel.ac.in/courses/112/104/112104298/>
3. <https://nptel.ac.in/courses/112/105/112105249/>
4. <http://robotics.itee.uq.edu.au/~metr4202/2013/lectures.pdf>

**MANAGEMENT SCIENCE
(Open Elective-II)**

VI Semester
Course Code: 201ME6006

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summerize management and motivation theories to renovate the practice of management
- CO2: Explain concepts of quality management and use process control charts, concepts and tools of quality engineering.
- CO3: Illustrate the functional management challenges associated with different changes in the organizations.
- CO4: Compute Optimum Project Duration and Cost in Crashing of PERT and CPM Networks
- CO5: Interpret the process of strategic management and to provide basic insights into contemporary management practices.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to Management:

Concept nature and importance of Management, Generic Functions of Management, and Evaluation of Management thought, Theories of Motivation, Decision making process, Designing organization structure, Principles of organization

Unit – II

Operations Management :

Principles and Types of Management, Work study-, Statistical Quality Control, Control charts (P-chart, R-chart, and C-chart) Simple problems, Material Management: Need for Inventory control, EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis), Just-in- Time(JIT) system, Total Quality Management(TQM), Six sigma, supply chain management

Unit – III

Functional Management :

Concept of HRM, HRD and PMIR, Functions of HR Manager, Wage payment plans(Simple Problems) ,Job Evaluation and Merit Rating ,Marketing Management, Functions of Marketing, strategies based on product Life Cycle, Channels of distributions.

Unit – IV

Project Management :

Development of Network, Difference between PERT and CPM, Fulkerson's Rule, Finding Critical Path, Probability of completion of project, Project Crashing.

Unit – V

Strategic Management :

Vision, Mission, Goals, Strategy, Elements of Corporate Planning Process ,Environmental Scanning ,SWOT analysis, Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives, Basic concepts of MIS, ERP, Capability Maturity Model(CMM) Levels, Balanced Score Card.

Text Books:

1. Management Science by Aryasri; Publisher: Tata McGraw Hill, 2009
2. Management by James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R. Gilbert 6th Ed; Publisher: Pearson Education/Prentice Hall.

Reference Books:

1. Principles of Marketing: A South Asian Perspective by Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri, and Eshan ul Haque , 2010, 13th Edition, Publisher: Pearson Education/ Prentice Hall of India.
2. A Handbook of Human Resource Management Practice by Michael Armstrong, 2010; Publisher: Kogan Page Publishers.
3. Quantitative Techniques in Management by N.D. Vohra, 4th edition, 2010; Publisher: Tata McGraw Hill.
4. Operations Management: Theory and Practice by B. Mahadevan, 2010; Publisher: Pearson Education.

Web Links:

1. www.managementstudyguide.com
2. www.citehr.com
3. www.nptel.ac.in/courses/122106032
4. www.btechguru.com/courses--nptel--basic-course

ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION
(Open Elective-II)

VI Semester
Course Code: 201ME6007

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Describe the meaning and concepts of entrepreneurship development
- CO2: Apply the business plan for preparation and evaluation of project.
- CO3: Explain about Institutional Support to Entrepreneur and MSMEs
- CO4: Explain about the Opportunities of Entrepreneurship Internationally.
- CO5: Explain about Informal Risk Capital, Venture capital and Social responsibility for entrepreneurship

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Entrepreneur &Entrepreneurship:

Entrepreneur &Entrepreneurship: Meaning of entrepreneur - Evolution of the concept - Functions of an Entrepreneur - Types of Entrepreneur - Intrapreneur- an emerging class - Concept of Entrepreneurship - Evolution of Entrepreneurship - Development of Entrepreneurship - Entrepreneurial Culture - Stages in entrepreneurial process.

Unit – II

Business Planning Process:

Meaning of business plan - Business plan process - Advantages of business planning - Marketing plan - Production/operations plan - Organization plan - Financial plan - Final Project Report with Feasibility Study - preparing a model project report for starting a new venture.

Unit – III

Institutions supporting Entrepreneurs

Small industry financing institutions in developing countries - A brief overview of financial institutions in India - Central level and state level institutions - SIDBI - NABARD - IDBI - SIDCO

- Indian Institute of Entrepreneurship - DIC - Single Window - Latest Industrial Policy of Government of India.

Unit – IV

International Entrepreneurship Opportunities:

The nature of international entrepreneurship - Importance of international business to the firm - International versus domestic entrepreneurship - Stages of economic development - Entrepreneurship entry into international business - exporting - Direct foreign investment - barriers to international trade.

Unit – V

Informal Risk Capital and Venture Capital:

Informal risk capital market - venture capital - nature and overview - venture capital process - locating venture capitalists - approaching venture capitalists. Social Entrepreneurship: Social enterprise-need - types - characteristics and benefits of social enterprises-Social entrepreneurship - Rural entrepreneurship, MSME Policies. Make-In India, Start-Up India, Stand-Up India.

Text Books:

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012
2. VSP Rao, Kuratko: "Entrepreneurship", Cengage Learning, New Delhi, 2011.
3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012.

Reference Books:

1. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011.
2. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi, 2012
3. P.C.Shekhar: "Entrepreneurship Development", Everest Publishing House, New Delhi, 2011.
4. R.H. Hisrich, M.P. Peters and D.A. Shepherd: "Entrepreneurship" Mc Graw Hill Irwin, 8 th Edition,2010.
5. Ryszard Praszkier& Andrzej Nowak: "Social Entrepreneurship: Theory and Practice Paperback – Illustrated", Cambridge University Press, New York-February 2, 2012.

Web Links:

1. <http://nptel.ac.in/courses>
2. <https://www.tutorialspoint.com>
3. www.tutorialspoint.com

AUTOMOTIVE AERODYNAMICS
(Open Elective-II)

VI Semester
Course Code: 201ME6008

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Demonstrate knowledge and understanding of aerodynamics in automotive field
- CO2: Evaluate basic fluid theory
- CO3: Analyse the Aerodynamic aspects of the Passenger Cars
- CO4: Analyse the Aerodynamic aspects of the high performance cars
- CO5: Analyse the Aerodynamic aspects of the Commercial vehicles
- CO6: Analyse the Aerodynamic of special purpose vehicles.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	3	2
CO2	3	3
CO3	3	2
CO4	3	2
CO5	3	2
CO6	3	2

Unit - I

Introduction

Basic Principles; working methods; historical development; basic shapes; streamlined shapes; optimization of body details; shape developments; trucks and buses; development trends vehicle engineering and development

Unit – II

Properties of Incompressible Fluids

Viscosity; external flow pattern related to vehicles, applications, boundary layer theory, laminar and turbulent boundary layer, separation, Friction drag, pressure drag, overall forces and moments, Internal flow phenomena- laminar and turbulent pipe flow, curved pipes, inlets, local contractions, enlargements, relation between external and internal flow of vehicles

Unit – III

Aerodynamic drag of Passenger cars

Passenger car as a bluff body; flow field around the car; forebody wind shield- A shield; Roof , vehicular rear end; side body; underside; wheels and wheel wells; front spoiler; rear spoiler; attachments; drag from flow through the car; trailers and roof luggage racks and shape optimization.

Unit – IV

Aerodynamic drag of High performance vehicles

Introduction; historical developments; influence of aerodynamics as high performance vehicles – drag and lift; handling – driving tests; angle of attack and yawed air force, draughting, cooling and ventilation; design alternatives, drag and lift , influence at near sonic speeds.

Unit – V

Aerodynamic drag of Commercial Vehicles

Introduction; tractive resistance and fuel consumption; drag reduction; aerodynamic drag coefficients of different commercial vehicles – operation still in air, drag is a function of yaw angle, wind influence, characterization of air resistance in actual operating conditions, drag minimization on trucks,

Text Books:

1. Automotive Aerodynamics; update Sp-706- SAE-1987
2. Vehicle Aerodynamics- SP 1145- SAE 1996

Reference Books:

1. Joseph Katz, Automotive Aerodynamics, 2016, John Wiley & Sons Ltd.
2. Wolf-Heinrich Hucho, Aerodynamics of Road Vehicles from Fluid Mechanics to Vehicle Engineering, 1987, Butterworth Heinemann Ltd.,

Web Links:

1. <https://nptel.ac.in/courses/101/105/101105088>

PRINCIPLES OF COMMUNICATIONS (Open Elective-II)

VI Semester
Course Code: 201EC6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Summarize the functional blocks of a communication system.
- CO2** Illustrate the working principle of amplitude modulation and demodulation.
- CO3** Compare types of amplitude modulation.
- CO4** Analyse the generation and detection of FM and PM signals.
- CO5** Classify the radio transmitter and receivers.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Definition of Signal, Types of signals, Fourier Transform(FT), Inverse Fourier Transform(IFT) and their properties, Introduction to Communication system, Elements of Communication system, Modulation, Need for Modulation, Electromagnetic Spectrum, Frequency Division Multiplexing(FDM).

Unit - II

Amplitude Modulation: Introduction to Amplitude Modulation (AM), Square law modulation, Envelope detector, Spectrum of AM Signals, Power and Power Efficiency of AM, Double Sideband Suppressed Carrier ((DSB-SC) Modulation, Spectrum of DSB-SC Signals, Balanced modulator, Coherent Demodulation of DSB-SC signals, Introduction to Single Sideband (SSB) Modulation and VSB modulation.

Unit - III

Angle modulation: Introduction, Phase Modulation, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Direct Method of FM generation, Phase locked loop, Comparison of FM and AM.

Unit – IV

Radio Transmitters and Receivers:Introduction, Classification of Transmitters, AM Transmitter, Variable Reactance type FM Transmitter, Radio Receiver types, TRF Receiver, Super heterodyne Receiver, FM receiver, Comparison of AM and FM receivers.

Unit – V

Pulse Modulation:Need for Digitizing Analog information, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Time Division Multiplexing, Introduction to Pulse Code Modulation and Delta Modulation.

Text Books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007, 3rd Edition.
2. Communication Systems: Analog and Digital, R P Singh and S D Sapre, McGraw Hill India, Third Edition.
3. Communication Systems – B. P. Lathi, BS Publication, 2006

Reference Books:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Analog and Digital Communications: Theory and Lab Work- Abhay Gandhi, Cengage, 2015.

Web Links:

1. [https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee08/Principles of Communication Systems-I, Prof.Aditya K.Jagannatham, IIT Kanpur.](https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ee08/Principles_of_Communication_Systems-I_Prof.Aditya_K.Jagannatham_IIT_Kanpur)
2. https://onlinecourses.nptel.ac.in/noc21_ee74/preview,AnalogCommunication,Prof.GoutamDas, IITKharagpur.

BIOMEDICAL INSTRUMENTATION
(Open Elective-II)

VI Semester
Course Code: 201EC6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Summarize the physiological relation of the human body with the environment and bio potentials
- CO2** Illustrate various electrodes sensing and measurement devices of electrical origin
- CO3** Choose a device for measurement of cardiovascular and respiratory signals.
- CO4** Make use of therapeutic equipment for bio medical signals.
- CO5** Interpret the methods for diagnostic techniques.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body. Bioelectric Potential Electrodes- Examples, Physiological signals, Bio-Amplifiers, transducers- Piezo-electric and ultrasonic, Bio Sensors – Principles – Piezo-electric, Thermal, Optical. Safety issues from electrical Hazards

Unit – II

Biopotential Measurements: Bio signals characteristics – frequency and amplitude ranges. ECG – Einthovens triangle, standard lead system, Measurement of Heart sound, Recording methods. EEG – 10-20 electrode system, unipolar, bipolar and average mode, Recording methods. EMG- unipolar and bipolar mode, Recording methods. Recording of ERG, EOG and EGG

Unit – III

Non-Electrical Measurements:Heart and Cardiovascular System, Electro Cardiograph, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Angiogram. Body Plethysmography- Blood Gas analysers, pH of blood. Respiratory System: The Physiology of the Respiratory System, Tests and Instrumentation for the Mechanics of Breathing, Respiratory Therapy Equipment.

Unit – IV

Critical Care Equipment: Elements of Intensive-Care Monitoring, Clinical Laboratory Instruments, Biomaterials, Ventilators: Mechanics of respiration, artificial ventilators, Positive pressure ventilator, Types

and classification of ventilators. Cardiac Defibrillators: Need for defibrillators, DC defibrillator, Implantable defibrillators, Defibrillator analyzer.

Therapeutic Equipment: Cardiac pacemakers: Need for cardiac pacemakers, External and implantable pacemakers. Audiometers and Hearing Aids, Myoelectric Arm, Physiotherapy Equipment: Diathermy-short wave, Microwave, and ultrasonic. Electrotherapy Equipment: Nerve muscle stimulator, Functional electrical stimulator

Unit – V

Diagnostic Techniques and Biotelemetry: Principles of Ultrasonic Measurement, Ultrasonic imaging, Ultrasonic Applications of Therapeutic uses, Ultrasonic diagnosis, X-Ray and Radio-Isotope instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Telemedicine Technology.

Introduction to Telemedicine, Cyber Medicine, Applications of Telemedicine: Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, the Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring, wireless wearable technology in health care monitor

Text Books:

1. Bio-Medical Instrumentation Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, 2nd edition, PHI, 2011
2. Introduction to Bio-Medical Equipment Technology - Joseph J. Carr, John M. Brown, 4th edition, Pearson Publications, 2012.
3. Medical Instrumentation Application and design, John G. Webster, Wiley India Edition, 2009.
4. Handbook of Biomedical Instrumentation, Khandpur R.S, Tata McGraw-Hill, New Delhi, 2nd edition, 2003

Reference Books:

1. Handbook of Bio-Medical Instrumentation, Khandapur, R.S., McGrawHill, 2nd edition, 2003.
2. Biomedical Instrumentation, Arumugam, M., Anuradha Publications, 2006.
3. Health Care Systems, Technology and Techniques, Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Springer, 1st Edition, 2011.
4. Standard Handbook of Biomedical Engineering and Design, Myer Kutz, McGraw Hill Publisher, 2003.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc21_ee17/preview, IIT Kharagpur, By Prof. Sudipta Mukhopadhyay
2. <https://www.class-central.com/course/nptel-medical-image-analysis-7934>, IIT Kharagpur, By Prof. Debdoot Sheet
3. <https://www.electrical4u.com/introduction-to-biomedical-instrumentation/>

ECAD TOOLS (Open Elective-II)

VI Semester
Course Code: 201EC6O03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Summarize the basic concepts on ECAD tools and PSPICE.
- CO2: Build various types passive element circuits and its performance using PSPICE.
- CO3: Construct BJT configuration amplifiers using PSPICE.
- CO4: Build various FET amplifiers circuits using PSPICE.
- CO5: Make use of MATLAB functions for solving the mathematical equations.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to ECAD tools: Introduction, various ECAD tools, applications of ECAD tools

Introduction to PSPICE: History, professional version, types of sources, analysis menu, circuit topology and analysis.

Unit – II

Implementation of passive circuits (RC, RL, LC, RLC) using Pspice: Voltage-current relation of an inductors, capacitors, series and parallel connections of initially uncharged capacitors and inductors, phasor relation for a resistor, capacitor, inductors. Charging and discharging responses of capacitors and inductors, natural responses of RLC circuits.

Unit – III

Implementation of active circuits using PSPICE: Diodes, transistor switches, BJT amplifiers-CE amplifier, CC amplifier, differential amplifier, and tuned amplifier, JFET amplifiers, MOSFET amplifiers-common source amplifier, common drain amplifier.

Unit – IV

Introduction to MATLAB: Array of numbers, MATLAB for plotting, functions in MATLAB, Vectors and matrices, linear equations geometry and statics, polynomial equations, Iterative solution of equations

Unit – V

MATLAB Simulink: Introduction to Simulink, model of momentum law, capacitordischarge, a mass spring dash spot system, series RLC circuit.

Applications of frequency domain: Introduction, signals, DFT, power spectrum,trigonometric expansion of signals, high frequency signals.

Text Books:

1. Circuit analysis with PSPICE, Nassir H. Sabah, 2017.
2. MATLAB and Simulink, Adrian B. Biran, CRC press Taylor& Francis group.

Reference Books:

1. Electronics Circuits and Systems, Owen Bishop, 4th edition, 2011.
2. MATLAB for Electrical and computer engineering, Roland Priemer, 2013.

Web Links:

1. <https://www.mccormick.northwestern.edu/documents/students/undergraduate/introduction-to-matlab.pdf>
2. <https://vdocument.in/orcad-pspice-course-material.html>

PYTHON PROGRAMMING
(Open Elective-II)

VI Semester
Course Code:201CS6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Develop programs using fundamental concepts in python
- CO2:** Solve problems using control statements and string methods
- CO3:** Develop real time applications using data structures and functions
- CO4:** Apply Object Oriented Programming concepts and files
- CO5:** Illustrate File handling in Python
- CO6:** Build various applications using GUI and exceptions.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	-	2	-	-	-	-	-	-	2
CO2	-	2	3	-	2	-	-	-	-	-	-	2
CO3	-	3	2	-	2	-	-	-	-	-	-	2
CO4	-	3	2	-	2	-	-	-	-	-	-	2
CO5	3	2	-	-	2	-	-	-	-	-	-	2
CO6	-	1	2	-	3	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit – I

Introduction: History of Python, Python Language, Features of Python, Applications of Python, Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation

Unit – II

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue.

Unit – III

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions.

Unit – IV

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Unit – V

Modules: Creating modules, import statement, from.import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orieley

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

Web Links:

1. <https://www.python.org/>
2. <https://www.tutorialspoint.com/python/index.htm>

WEB TECHNOLOGIES
(Open Elective-II)

VI Semester
Course Code: 201CS6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Develop static web pages using HTML and CSS.
- CO2: Apply JavaScript for Client side validations and Node.JS to learn server side applications using JavaScript.
- CO3: Make use of Angular JS for developing dynamic and responsive web pages.
- CO4: Utilize React JS for developing dynamic and responsive web pages.
- CO5: Create and deploy secure, usable database driven web applications using PHP and MySQL/MongoDB.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

HTML, HTML5, CSS, CSS3 HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML Media, Iframes, Images, Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML. CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Box Model, Conflict Resolution, CSS3.

Unit - II

JavaScript & XML Javascript - Introduction, Primitives, Variables – var, let, const, Operations and Expressions, Control Statements, Functions, Objects (Predefined - String, Number, Array, Date, Math, Random, RegExp, User Defined – Definition, Properties, Methods, Display, Accessors, Constructors), Events, Pattern Matching using Regular Expressions, Working with XML: Document type Definition (DTD), XML schemas, XSLT, XML and CSS, Document object model, Parsers - DOM and SAX.

Unit - III

Node JS & Angular JS Node.js- Introduction, Advantages, Process Model, Modules, HTTP Module, File system, URL module, NPM, Events, Upload Files, Email. Angular JS – Introduction, Expressions, Modules, Directives, Model, Data Binding, Controllers, Scopes, Filters, Services, HTTP, Tables, Select, Events, Forms, Validation, API, W3.CSS, Includes, Routing, SQL, DOM, Application.

Unit – IV

React JS React JS – Introduction, Displaying “Welcome React”, Introducing JSX, Rendering Elements, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms, Lifting State Up, Composition vs Inheritance, Thinking in React.

Unit – V

PHP PHP Programming - Introduction, Creating and Running PHP Script. Variables, Constants, DataTypes, Operators. Controlling Program Flow - Conditional and Loop statements, Arrays, Functions, Client-Server Scripting – XAMPP/LAMP Introduction, Running PHP Script in XAMPP, Super Globals, Working with Form Data, Database Connectivity – MySQL Introduction using XAMPP in Command Mode and GUI, Working with MySQL Queries, Integrating PHP and MySQL to work with Form Data. No SQL Database - MongoDB Introduction, Create and Drop Database, Create and Drop Collection, Data Types, Insert, Query, Update, Delete, Integrating PHP with MongoDB.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. React Explained, 2020 Edition, Zac Gordon, OSTraining.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. <https://www.w3schools.com/> (html, css, js, xml, nodejs, angular, react, php)
2. <https://www.angular.io/docs>
3. <https://www.reactjs.org/docs/getting-started.html>
4. <https://www.university.mongodb.com/>

OPERATING SYSTEMS (Open Elective-I)

VI Semester
Course Code:201IT6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Illustrate the basic structure, services, system calls and architectural components of Operating Systems.
- CO2: Analyze various Process Scheduling algorithms and Multi threading models.
- CO3: Demonstrate Inter Process Communication between the processes and deadlocks.
- CO4: Make use of paging, segmentation and virtual memory strategies to allocate memory for the process.
- CO5: Describe the concepts of file system implementation, disk management, Protection and security for system.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	2	-
CO2	3	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit - I

Introduction to Operating System Concepts: What Operating System do, Operating System Structure, Operating System Operations, Process Management, Memory management, Storage Management, Protection and Security, Computing Environments, Open-Source Operating systems, Operating systems services, System call, Types of System call.

Unit - II

Process Management:

Process concept: The process, Process State, Process control block, Threads, Process Scheduling: Scheduling Queues, Schedulers, Context switch, Operations on Processes, Inter process Communication.

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Multithread Programming: Overview, Benefits, Multithreading Models.

Unit - III

Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods for handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit – IV

Memory Management: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Background, Demand Paging, Page Replacement, Thrashing.

Unit – V

File system Interface: File concept, Access Methods, Directory and Disk structure, File system mounting, File sharing, protection.

Implementing Filesystems: File system structure, File System implementation, Directory Implementation, allocation methods, free-space management.

Mass-storage structure: Overview of Mass-storage structure, Disk scheduling

Text Books:

1. Operating System Concepts, Abraham Silber Schatz, Peter Balian Greg Gagne,
2. Operating Systems-Internals and Design Principles, William Stallings, 6thEdition, Prentice Hall.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum,2nd Edition, AddisonWesley.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata McGrawHill Education.
3. Operating Systems: A Concept-Based Approach, DMD hamdhere, 2ndEdition,

Web Links:

1. <http://nptel.ac.in/downloads/106108101/>
2. <https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems>
3. <http://www.geeksforgeeks.org/operating-systems/>
4. <https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923>

ROBOTIC PROCESS AUTOMATION
(Open Elective-II)

VISemester
Course Code:201IT6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** DescribethefundamentalsofRoboticProcessAutomationTechnology.
- CO2:** SummarizetheUiPathprogrammingtechniquestodeployrobotconfigurations.
- CO3:** Explorevariousdataextractiontechniquesandlearn aboutintegrations.
- CO4:** Developaprogrammedrobotforloggingwithpopular applicationslikeSAPandMS Office.
- CO5:** Developaprogrammedrobotfor exceptionhandlingfor applications.
- CO6:** CreateandDeploytheBotsandcontrolit withUiPath

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	1	2	-	-	-	-	-	-	-	-
CO2	-	1	3	1	-	-	-	-	-	-	-	-
CO3	-	2	-	3	2	-	-	-	-	-	-	-
CO4	-	2	2	2	3	-	-	-	-	-	-	-
CO5	-	2	2	3	-	-	-	-	-	-	-	-
CO6	-	2	1	3	2	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit – I

Robotic Process Automation (RPA) -Introduction - Scope of RPA - Techniques of automation - What can RPA do - Benefits of RPA - Components of RPA: Recorder, Development studio, Extensions and plugins, Bot runner, Control center- RPA platforms: Automation Anywhere, UiPath, Blue Prism, Work Fusion, Thoughtonomy, KOFAX - UiPath: UiPath Studio – UiPath Robot - UiPath Orchestrator - The future of automation.

Record and Play:UiPath stack: UiPath Studio - UiPath Robot - UiPath Orchestrator -Downloading and installing UiPath Studio - Learning UiPath Studio: Projects, the user interface- Ribbon - Quick Access Toolbar - Panels - Argument, Task recorder - input and output methods - Examples using the recorder.

Unit – II

Sequence, Flowchart, and Control Flow: Sequencing the workflow - Sequence - Activities - Flowcharts - Control flow - various types of loops, and decision making: Assign, Delay, Break, While, Do-While, for each, If, and Switch activities -Examples using Sequence and Flowchart

Unit – III

Data Manipulation: Variables and scope - Collections - Arguments - Data tables – Clipboard management – File operation - CSV/Excel to data table and vice versa

Taking Control of the Controls: Finding and attaching windows - Finding the control - Techniques for waiting for a control - Act on controls: mouse and keyboard activities

Working with UiExplorer- Handling events: Element, Image, and System triggering events - Revisit recorder - Screen Scraping - OCR: Types and usage

Unit – IV

Handling User Events and Assistant Bots: What are assistant bots - Monitoring system event triggers - Monitoring image and element triggers - Launching an assistant bot on a keyboard event
Exception Handling, Debugging, and Logging: Exception handling: Common exceptions and handling them - Logging and taking screenshots: Client and Server logging – Debugging techniques - Collecting crash dumps - Enabling crash dumps - Error reporting

Unit – V

Managing and Maintaining the Code: Project organization: Picking an appropriate layout for workflows, breaking a process into smaller parts, using exception handling - Nesting workflows - Reusability of workflows - Commenting techniques -

State Machine.

Deploying and Maintaining the Bot: Publishing using publish utility: How to publish a workflow in UiPath - Overview of Orchestration Server - Using Orchestration Server to control bots - Publishing and managing updates

Text Books:

1. Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishers, ISBN 13: 9781788470940, Paperback,

Reference Books:

1. Richard Murdoch, “Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant”, (independently published by author, Amazon), ISBN-10: 1983036838, ISBN-13: 978-1983036835.
2. Kelly Wibbenmeyer, “The Simple Implementation Guide to Robotic Process Automation (RPA)”, iUniverse, ISBN-10: 1532045883, ISBN-13: 978-1532045882.

Web Links:

1. <https://www.udemy.com/topic/robotic-process-automation>
2. <https://www.uipath.com/rpa/academy>
3. <https://www.youtube.com/watch?v=MBI-3Yb30FA>
4. <https://www.coursera.org/learn/robotic-process-automation>

UNCONVENTIONAL HYDROCARBON RESOURCES

(Open Elective-II)

VI Semester
Course Code: 201PT6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Outline the fundamentals of coal bed methane
- CO2: Estimate the shale gas reserves for indian scenario
- CO3: Determine the extent of gas hydrates resource estimation
- CO4: Illustrate the origin and characterize shale gas
- CO5: Explain the heavy oil reservoirs and their challenges

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to Unconventional Hydrocarbon resources, Coal Bed Methane: Geological controls in CBM plays, Resource estimation, Drilling, completion and production performance of a CBM well, Indian Scenario

Unit – II

Shale Gas / oil: Rock property evaluation of shale and resource estimation, production techniques applied for shale gas, monitoring techniques including microseismic, Indian basins for shale gas/oil potential

Unit – III

Gas Hydrates: Structure of gas hydrates and their stability, rock properties of formation bearing gas hydrates, distribution throughout the world, wireline logs and seismic characters of gas hydrates, productivity of gas hydrates and challenges, Indian scenario of gas hydrates

Unit – IV

Deepwater Oil and Gas Technology: Deepwater exploration and production in the world, role of geophysical methods, technological challenges in deepwater drilling and production

Unit – V

Heavy oil: world resources of heavy oil, production technology and challenges

Text Books:

1. A Guide to Coal Bed Methane from GRI

Reference Books:

- 1.
2. Gas Hydrates — Geophysical Exploration Techniques And Methods By Michael Riedel, Eleanor C. Willoughby And Satinder Chopra
3. Dayal, A. And Mani, D. Shale Gas. Amsterdam [Etc.]: Elsevier. 2017
4. Shale Oil And Shale Gas Resources. : Mdpi A, José A. Torres And Hector Klie, 2020.

Web Links:

1. https://author.energy-community.org/enc-author-prd/dam/jcr:4c5bb3db-e989-4b7d-a33e-244f4a51164a/1_PetroleumResEng_Basics.pdf
2. https://petrowiki.org/Fluid_sampling
3. https://petrowiki.org/Material_balance_in_oil_reservoirs
4. https://en.wikipedia.org/wiki/Darcy%27s_law
5. https://petrowiki.org/Oil_well_performance

ASSET MANAGEMENT
(Open Elective-II)

VI Semester
Course Code: 201PT6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Outline the fundamentals of asset management
- CO2: Estimate the running costs and value for asset management
- CO3: Determine the value of data using Asset Management Network
- CO4: Illustrate Asset Management Decision making framework
- CO5: Explain the capital planning system

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Asset Management: The Corporate Dimension, Vision, Suggested Corporate Approach, Asset Management Building Blocks

Unit – II

Asset Management: Data Gathering, The Building Blocks Of Asset Management: Descriptions, The Main Building Blocks Of Asset Management: Condition, The Main Building Blocks Of Asset Management: Suitability, The Main Building Blocks Of Asset Management: Sufficiency, The Building Blocks Of Asset Management: Accessibility, Running Costs And Value, The Improvement Service Screening Survey.

Unit – III

Asset Management: Interpreting, the Main Data, Data Recording, Quality Assurance, Creating A Baseline Position

Unit – IV

Developing A Decision Making Framework, Populating Asset Management Plans, Creating A Strategic Outline Business Case (SOBC) For Investment, The Corporate Asset Management Plan

Unit – V

Developing an Integrated Asset Management and Capital Planning System, Overview, An Integrated Framework, Governance Arrangements

Text Books:

1. A guide to Asset Management and Capital Planning in Local authorities, CIPFA, 2008.

Reference Books:

1. The Big Picture: Integrated Asset Management Cedric Bouleau et al, Oil field Review, 2007/2008
2. Integrated Petroleum Reservoir Management, A team approach, AbdusSatter and Ganesh C. Thakur, Pennwell Books, Tulsa, 1994.

Web Links:

1. https://author.energy-community.org/enc-author-prd/dam/jcr:4c5bb3db-e989-4b7d-a33e-244f4a51164a/1_PetroleumResEng_Basics.pdf
2. https://petrowiki.org/Fluid_sampling
3. https://petrowiki.org/Material_balance_in_oil_reservoirs
4. https://en.wikipedia.org/wiki/Darcy%27s_law
5. https://petrowiki.org/Oil_well_performance

INDUSTRIAL SAFETY PRACTICES
(Open Elective-II)

VI Semester
Course Code: 201MI6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the different hazards and its prevention in mining industries.
- CO2: Distinguish the mine accidents occurring in surface and underground mining area
- CO3: Illustrate the various approaches towards safety risk assessment.
- CO4: Discuss the safety planning and safety management systems
- CO5: Analyze the innovations in mine safety engineering

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Safety and Health

Terminologies associated with safety, Occupational health and safety, Safety and Health training, Stress and Safety. Safety Psychology.

Unit – II

Ergonomics

Ergonomics - Introduction, Definition, Objectives, Advantages. Ergonomics Hazards
– Musculoskeletal Disorders and Cumulative Trauma Disorders.

Unit – III

Industrial safety

Importance of Industrial safety, Safety of Environment, Process safety, fire safety, Electrical safety, Industrial safety polices, Emergency preparation and response in disaster.

Unit – IV

Safety Analysis Techniques

Safety organizers structures, Assessment of risk rating, Minimization of risk, Risk management.

Unit – V

Safety education and training, Safety information system, Safety standards- OHSAS 18001, ISO 45001, Safety Audit

Text Books:

1. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai
2. Grimaldi and Simonds , Safety Management, AITBS Publishers , New Delhi (2001)
3. Industrial Safety –National Safety Council of India ISHET.
4. “Safety in Industry” N.V. Krishnan Jaico Publishery House, 1996.

Reference Books:

1. “Accident Prevention Manual” – NSC
2. “Occupational safety Manual” BHEL
3. “Safety Management by John V. Grimaldi and Rollin H. Simonds
4. Dr. K. U. Mistry - Fundamentals of Industrial Safety & Health

Web Links:

1. <https://www.osha.gov/>
2. <https://www.healthandsafetyatwork.com/>
3. <http://ohsonline.com/>

ELECTRICAL EQUIPMENT IN MINES
(Open Elective-II)

VI Semester
Course Code: 201MI6O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain about power systems used in mines.
- CO2: Analyze various earthing methods used in mines.
- CO3: Summarize various electrical equipments used in mines.
- CO4: Discuss about the instrumentation and control systems used in mines
- CO5: Analyze about intrinsic safety.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Mine power supply

Choice of voltage, surface and underground supply: Tariff Computation, standards of lighting and method of illumination in open cast and underground Mine Cables- types, Construction details, installation of cables through shaft and other locations, fault location, cable jointing, care and maintenance, Gate-end boxes and switch gears. Principles of flame-proof enclosures

Unit – II

Earthing

Earthing Methods, protective devices, overload, under-voltage earth leakage, D.C. Supply- rectifiers, storage batteries.

Unit – III

Electrical Equipment

Mining transformers used in mines, lighting transformer, no load-on-load operations, losses and efficiency and voltage regulation. A.C. and D.C. Motors speed-torque characteristics, starting, braking, speed control, drives for haulage, ventilation fans, pumps, compressors, electrical locomotives, winders, Introduction to thyristor device, flame proof and intrinsic safety.

Unit – IV

Control and instrumentation Open and closed loop system, remote control, sequence control, winder control of open cast mine equipment, sensor for measurement of various operational, environmental and safety parameters in underground and open cast mines.

Unit – V

Communication and data transmission

Mine telephone system, signaling system, LAN, WAN

Intrinsically – safe circuit – methods of attaining intrinsic safety, zener safety barriers and their application.
Indian electricity Act and rules 1956 as applied to mines.

Text Books:

1. Electrical equipment in Mines by H.Cotton
2. Electrtechnology mining by N.Merinovic

Reference Books:

1. AmitoshDey, Heavy Earth Moving Machinery, Lovely Prakashan Publications, Dhanbad, 2000.
2. Walker, S.C., Mine Winding and Transport, Elsevier, 1988. 7.
3. Alemgren G., Kumar U., and Vagenas N., Mine Mechanisation and Automation, A.A., Balkema Publication, 1993.

Web Links:

1. http://mineportal.in/upload-study-material.php?imgaaa=1&imagename=MINE%20MACHINERY_243.pdf
2. http://mineportal.in/assets/study_material/Locomotive_Haulage_221_mineportal.pdf

ENGINEERING PROPERTIES OF AGRICULTURAL PRODUCE (Open Elective-II)

VI Semester
Course Code: 201AG6O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Calculate the basic engineering properties of a biological material.
- CO2: Analyze the flow behavior of biological materials and force deformation.
- CO3: Analyze the Maxwell and Kelvin model equations in the rheology for important biological materials.
- CO4: Explain the applications of frictional and aerodynamic properties in the design of processing equipment.
- CO5: Explain the applications of electrical and thermal properties in the design of processing equipment.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Physical Properties: Introduction and application of engineering properties of biological material. Physical properties of different food commodities and aided products – importance. Shape and size – criteria for describing shape and size. Roundness and sphericity – Volume and density – Specific gravity – Bulk density. Porosity – surface area – measurement of the same.

Unit – II

Rheology: Introduction to rheology, basic concepts, Classification of rheology, ASTM standard definition of terms. Rheological Properties, Flow behavior of biological materials, force deformation curve; linear elastic limit, yield point, bio-yield point and rupture point. Stress relaxation and creep behavior. Visco-elasticity and visco-plasticity.

Unit – III

Rheological models: Introduction to mechanical models. Kelvin and maxwell models. Electrical equivalence of mechanical models. Rheological equations of maxwell model, generalized maxwell model, kelvin model and generalized kelvin model. Difference between kelvin and maxwell model. Viscosity; Measurement of viscosity using viscometer, types of viscometer, problems on viscometer.

Unit – IV

Frictional Properties: Basic concepts, effect of load sliding velocity. Friction in agricultural materials, measurement. Rolling resistance, angle of internal friction and angle of repose. Applications of frictional properties in design of processing equipment. Aerodynamic Properties: Importance of aerodynamic properties in Agricultural Processing equipments with examples. Terminal velocity and drag coefficient; frictional drag

and profit drag or pressure drag. Terminal velocity of different grains, working of pneumatic conveyor based on aerodynamic properties.

Unit – V

Electrical properties: Di-electrical properties; Dielectric loss factor and dielectric constant. Applications and role of electrical properties in food processing. Thermal Properties: Introduction to thermal properties; Specific heat, thermal conductivity, thermal diffusivity, latent heat of vaporization, latent heat of fusion, sensible heat, enthalpy and heat energy calculation.

Text Books:

1. Physical properties of plant and animal materials, Mohsenin N N, Gordon and Breach Science Publishers, New York, 2nd edition ,1986.
2. Engineering Properties of Foods, Rao M A, Syed S H Rizvi and Ashim K Datta, CRC Press – Taylor & Francis Group, Boca Raton, FL, 4th edition, 2014

Reference Books:

1. Food and Process Engineering Technology, Wilhelm LR, Suler W A and Brusewitz, G H, American Society of Agricultural Engineers (ASAE), St. Joseph, MI.
2. Engineering Properties of Biological Materials, O.P. Singhal and D.V.K. Samuel, SarojPrakashan, Allahabad, 1st edition, 2003.

Web Links:

1. http://ecourses.iasri.res.in/email_authentication.aspx?Degree_Id=04
2. <http://ecoursesonline.iasri.res.in/course/view.php?id=25>
3. <http://www.cigr.org/documents/CIGRHandbookVol4.pdf>
4. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1011>
5. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1013>
6. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1025>

PLASTIC APPLICATIONS IN AGRICULTURE (Open Elective-II)

VI Semester
Course Code: 201AG6O02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Assess types and quality of plastics used in soil and water conservation.
- CO2: Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting ponds.
- CO3: Design, estimation and installation of green, poly and shade net houses, low tunnels etc.
- CO4: Explain plastics application in drying, preservation, handling and storage of agricultural produce.
- CO5: Outline plastic usage with hands on experience through visit to a greenhouse and farmers field.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction of plasticulture - types and quality of plastics used in soil and water conservation, production agriculture and post harvest management. Quality control measures. Present status and future prospective of plasticulture in India. Water management - use of plastics in in-situ moisture conservation and rain water harvesting. Plastic film lining in canal, pond and reservoir. Design, estimation and laying of plastic films in lining of canal, reservoir and water harvesting Ponds.

Unit – II

Plastic pipes for irrigation water management, bore-well casing and subsurface drainage. Study of plastic components of drip and sprinkler irrigation systems, laying and flushing of laterals. Use of polymers in control of percolation losses in fields. Soil conditioning - soil solarisation, effects of different colour plastic mulching in surface covered cultivation.

Unit – III

Nursery management - Use of plastics in nursery raising, nursery bags, trays etc. Controlled environmental cultivation - plastics as cladding material, green / poly / shade net houses, wind breaks, poly tunnels and crop covers. Design, estimation and installation of green, poly and shade net houses, low tunnels etc.

Unit – IV

Plastic nets for crop protection - anti insect nets, bird protection nets. Plastic fencing. Plastics in drying, preservation, handling and storage of agricultural produce, innovative plastic packaging solutions for processed food products. Plastic cap covers for storage of food grains in open. Silage film technique for fodder preservation

Unit – V

Use of plastics as alternate material for manufacturing farm equipment and machinery. Plastics for aquacultural engineering and animal husbandry - animal shelters, vermi-beds and inland fisheries. Agencies involved in the promotion of plasticulture in agriculture at national and state level. Human resource development in plasticulture applications.

Text Books:

1. Dubois. 1978. Plastics in Agriculture. Applied Science Publishers Limited, Essex, England.
2. Chanda, Salil K. Roy. 2008. Plastics Fundamentals, Properties, and Testing. CRC Press.
3. Charles A. Harper. 2006. Handbook of Plastics Technologies. The Complete Guide to Properties and Performance. McGraw-Hill, New Delhi.
4. Central Pollution Control Board. 2012. Material on Plastic Waste Management. Parivesh Bhawan, East Arjun Nagar, Delhi-110032.
5. Brown, R.P. 2004. Polymers in Agriculture and Horticulture. RAPRA Review Reports : Vol. 15, No. 2, RAPRA Technology Limited, U.K

Reference Books:

1. Brahma Singh, Balraj Singh, Naved Sabir and Murtaza Hasan. 2014. Advances in Protected Cultivation. New India Publishing Agency, New Delhi.
2. Shankar, A.N. 2014. Integrated Horticulture Development in Eastern Himalayas, Plasticulture in Agri-Horticulture Systems, 241-247.
3. Ojha,T.P. and Michael, A.M., 2012, Principles of Agricultural Engineering - I. Jain Brothers, Karol Bagh, New Delhi.
4. Pandey, P.H. 2014. Principles and Practices of Agricultural Structures and Environmental Control. Kalyani Publishers, Ludhiana, India.

Web Links:

1. <https://krishi.icar.gov.in/jspui/bitstream/123456789/42008/1/Article%201.pdf>
2. https://saiplatform.org/wp-content/uploads/2019/06/190528-report_use-of-plastics-in-agriculture.pdf
3. https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_fg_plastic_footprint_minipaper_c_final.pdf

OPTIMIZATION IN OPERATIONS RESEARCH
(Job Oriented Elective - II)

VISemester
Course Code:201CS6J01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
- CO2:** Illustrate classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
- CO3:** Solve transportation and assignment problem by using Linear programming Simplex method.
- CO4:** Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions
- CO5:** Apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	-	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	-
CO4	2	2	1	3	-	-	-	-	-	-	-	-
CO5	2	2	2	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	3
CO3	-	3
CO4	-	2
CO5	-	2

Unit - I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions

Unit - II

Linear Programming : Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.

Unit – III

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

Unit – IV

Nonlinear Programming: Unconstrained cases, One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method.

Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods, Introduction to convex Programming Problem.

Unit – V

Dynamic Programming: Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

Text Books:

1. Engineering optimization: Theory and practice, S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. Introductory Operations Research, H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. Optimization Methods in Operations Research and systems Analysis”, by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr. S.D.Sharma, Kedarnath, Ramnath & Co

Web Links:

1. <https://krishi.icar.gov.in/jspui/bitstream/123456789/42008/1/Article%201.pdf>
2. https://saiplatform.org/wp-content/uploads/2019/06/190528-report_use-of-plastics-in-agriculture.pdf
3. https://ec.europa.eu/eip/agriculture/sites/default/files/eip-agri_fg_plastic_footprint_minipaper_c_final.pdf

MACHINE LEARNING USING PYTHON LAB
Common to CSE & IT

VISemester
Course Code:201CS6L01

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Implement concept learning algorithms on given data
- CO2:** Apply pre processing tecgniques on given data sets
- CO3:** Develop Machine Learning algorithms to solve a given problem
- CO4:** Implement supervised learning algorithms on a given data
- CO5:** Implement neural networks algorithms

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	2	-	-	-	1	1	-	2
CO2	2	2	3	-	2	-	-	-	1	1	-	2
CO3	1	2	3	2	2	-	-	-	1	1	-	2
CO4	1	2	3	2	2	-	-	-	1	1	-	2
CO5	1	2	3	2	2	-	-	-	1	1	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	3
CO3	-	1
CO4	-	2
CO5	-	2

List of Experiments:

Week - 1

Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Week - 2

For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Week - 3

Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Week - 4

Exercises to solve the real-world problems using Linear Regression

Week - 5

Exercises to solve the real-world problems using Logistic Regression

Week - 6

Exercises to solve the real-world problems using Binary Classifier

Week - 7

Develop a program for Bias, Variance, Remove duplicates , Cross Validation

Week - 8

Write a program to implement One-hot Encoding

Week – 9

Write a program to implement Categorical Encoding.

Week - 10

Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Week - 11

Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Week - 12

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

List of Augmented Experiments:

13. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
14. Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
15. Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
16. Consider Patient Dataset. Apply linear classification technique(SVM) to identify the rate of heart patients.

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.
2. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, O'reilly

Web Links:

1. <https://www.deeplearning.ai/machine-learningyearning/>
2. <https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. <https://www.udemy.com/course/machinelearning/>

COMPILER DESIGN AND OBJECT ORIENTED ANALYSIS AND DESIGN LAB

VISemester
Course Code:201CS6L02

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Make use of LEX tool to simulate various operations of compilers
- CO2:** Construct top down and bottom up parsing tables.
- CO3:** Develop various Optimization techniques.
- CO4:** Analyze the importance of unified modeling of various applications
- CO5:** Show the role and function of each UML model in developing object-oriented software.
- CO6:** Develop an application using UML.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	-	3	-	-	-	2	2	-	-
CO2	2	2	3	-	2	-	-	-	2	2	-	-
CO3	2	2	1	-	3	-	-	-	2	2	-	1
CO4	2	3	2	2	3	-	-	-	2	2	-	-
CO5	1	2	3	1	2	-	-	-	2	2	-	-
CO6	1	2	3	2	3	-	-	-	1	1	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	1	-
CO6	2	-

List of Experiments:

Week - 1

- 1)Lexical analysis using lex tool
 - 1.1) Write a lex program whose output is same as input.
 - 1.2) Write a lex program which removes white spaces from its input file

Week - 2

- 2)Lexical analysis using lex tool
 - 2.1) Write a lex program to identify the patterns in the input file.
 - 2.2) Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines.

Week - 3

- 3)First and Follow
 - 3.1)Simulate First and Follow of a Grammar.
 - 3.2)Implement the lexical analyzer using JLex, flex or lex or other lexical analyzer generating tools

Week - 4

- 4)Top Down Parsing
 - 4.1) Develop an operator precedence parser for a given language.
 - 4.2) Construct a recursive descent parser for an expression

Week - 5

- 5)Bottom up Parsing
 - 5.1) Construct a LL(1) parser for an expression
 - 5.2) Design a LALR bottom up parser for the given language.

Week - 6

- 6)Optimization Phase
 - 6.1) Write a program to perform loop unrolling.
 - 6.2) Write a program for constant propagation

Week - 7

List of Case Studies:

- Choose any two case studies and implement, the experiments (7-12)
 - 1) ATM Application.
 - 2) Library Management System.
 - 3) Online Book Shop.
 - 7) Develop Class Diagram and Object diagram using Rational Rose.

Week - 8

- 8) Develop Use case diagrams and elaborate Use case descriptions & scenarios

Week - 9

- 9) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Week - 10

- 10) Develop sample diagrams for state chart diagrams

Week - 11

- 11) Develop Detailed design using activity diagrams

Week - 12

- 12)Develop sample diagrams for other UML diagrams - component diagrams and deployment diagrams

List of Augmented Experiments:

- 13)Write a C program to identify whether a given line is a comment or not
- 14)Write a C program to simulate lexical analyzer for validating operators.
- 15)Design all UML models for Online Movie ticket Booking System
- 16)Develop Use case Packages and identify relationships between use cases and represent them. Refine domain class model by showing all the associations among classes

Reference Books:

1. Engineering a compiler, Keith D.Cooper & Linda Torczon, Morgan, 2nd Edition, 2011.
2. Compiler Design, K. Muneshwaran, 2nd Edition ,Oxford, 2013
3. Object-oriented analysis and design using UML, Mahesh P. Matha, PHI.
4. Head first object-oriented analysis and design, Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly.
5. The Unified modeling language Reference manual, James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley.

Web Links:

1. <http://dinosaur.compilertools.net/yacc/index.html>
2. <https://www.scribd.com/doc/26657257/Compiler-Design-Lab-Manual>
3. <https://www.geeksforgeeks.org/unified-modeling-language-uml>
4. <https://www.quora.com/in/What-are-the-best-website-to-study-UML-forbeginners>
5. <https://www.coursera.org/learn/object-oriented-design/lecture/6GJtg/1-1-3object-oriented-modeling>

CRYPTOGRAPHY AND NETWORK SECURITY LAB
Common to CSE & IT

VISemester
Course Code:201CS6L03

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Develop programs using stream and block cipher techniques.
- CO2:** Make use of symmetric and asymmetric cryptographic techniques for providing security to data at network level.
- CO3:** Apply the concepts of HMAC, CMAC and Hash functions.
- CO4:** Build applications using TCP and UDP echo server.
- CO5:** Develop networking applications that make use of PIPES, FIFO, Semaphores and queues.
- CO6:** Design applications using Remote Procedure Call (RPC).

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	1	1	-	1
CO2	2	2	2	-	-	-	-	-	1	1	-	1
CO3	2	2	3	-	-	-	-	-	1	1	-	1
CO4	2	1	2	-	-	-	-	-	1	1	-	1
CO5	2	3	1	-	-	-	-	-	1	1	-	1
CO6	2	2	2	-	-	-	-	-	1	1	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week - 1

Stream Ciphers

- 1.1) Write a C Program to implement Shift Cipher.
- 1.2) Write a C Program to implement Mono-Alphabetic Substitution Cipher.

Week - 2

Block Ciphers

- 2.1) Write a C Program to implement one-time pad cipher.
- 2.2) Write a C Program to implement vernam cipher

Week - 3

Symmetric Cryptography

- 3.1) Write a C Program to implement DES Algorithm.
- 3.2) Write a C Program to implement AES algorithm.

Week - 4

Asymmetric Cryptography

- 4.1) Write a C Program to implement RSA algorithm.
- 4.2) Write a C Program to implement Diffie-Helman Key Exchange Algorithm.
- 4.3) Write a C Program to implement Elgamal Cryptographic System.

Week - 5

Message Authentication Codes

- 5.1) Write a C Program to implement HMAC
- 5.2) Write a C Program to implement CMAC.

Week - 6

Hash Function

- 6.1) Write a C Program to implement SHA-512 Algorithm.

Week - 7

TCP Server Applications

- 7.1) Design TCP iterative Client and server application to reverse the given input sentence.
- 7.2) Design TCP client and server application to transfer file.

Week - 8

TCP Concurrent Server Applications

- 8.1) Design a TCP concurrent server to convert a given text into upper case using multiplexing system call “select”.
- 8.2) Design a TCP concurrent server to echo given set of sentences using poll functions.

Week – 9

UDP Applications

- 9.1) Design UDP Client and server application to reverse the given input sentence.
- 9.2) Design UDP Client server to transfer a file

Week - 10

IPC

Implement the following forms of IPC.

- a)Pipes
- b)FIFO

Week - 11

IPC Continued

Implement file transfer using Message Queue form of IPC.

Week - 12

RPC

Design a RPC application to add and subtract a given pair of integers.

List of Augmented Experiments:

13. Write a C Program to implement Elliptic Curve Cryptographic Algorithm
14. Write a C Program to implement Euclidian Algorithm to find GCD
15. Write a C Program to implement NSA Digital Signature Algorithm
16. Write a program to create an integer variable using shared memory concept and increment the variable simultaneously by two processes. Use semaphores to avoid race conditions

Reference Books:

1. Advance Unix Programming Richard Stevens, Second Edition Pearson Education
2. Advance Unix Programming, N.B. Venkateswarlu, BS Publication

Web Links:

1. <https://www.udemy.com/topic/python-network-programming/>
2. <https://www.udemy.com/course/programming-network-applications-in-java/>
3. <https://www.udemy.com/course/java-network-programming/>
4. <https://www.udemy.com/course/tcpipstack/>

BIG DATA:SPARK
(Skill Oriented Course-IV)
Common to CSE&IT

VISemester
Course Code:201CS6S01

L	T	P	C
0	0	4	2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Illustrate HDFS concepts and interfacing with HDFS.
- CO2:** Develop MapReduce Programs to analyze large dataset Using Hadoop and Spark
- CO3:** Write Hive queries to analyze large dataset.
- CO4:** Perform the filter, count, distinct, map, flatMap RDD Operations in Spark
- CO5:** Build Queries using Spark SQL
- CO6:** Apply Spark joins on Sample Data Sets

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	2	3	-	-	-	2	2	-	-
CO2	2	1	1	-	3	-	-	-	2	2	-	-
CO3	1	2	-	-	3	-	-	-	2	2	-	2
CO4	2	2	-	-	2	-	-	-	2	2	-	1
CO5	2	2	-	-	3	-	-	-	2	2	-	1
CO6	2	2	-	-	3	-	-	-	2	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

List of Experiments:

Week - 1

1. Hadoop File System Operations: Implement the following file management tasks in Hadoop: a.) Adding files and directories b.) Retrieving files c.) Deleting files.

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257430580733542457_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

Week - 2

2. Loading DataSet in to HDFS for Spark Analysis.

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_012610254178770944711_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

Week - 3

3. MapReduce-WordCount-Hadoop Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01257421539761356848_shared?collectionId=lex_auth_01256841991858585686_shared&collectionType=Course

Week - 4

4. MapReduce -WordCount -Spark Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_012610254178770944711_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

Week - 5

5. Hive Queries a) Install Hive Framework b) Implement Hive to create, alter, and drop databases, tables

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012578417114185728_48_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

Week - 6

6. Hive Queries Implement hive queries and joins to perform display and retrieve the data

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012578417114185728_48_shared?collectionId=lex_auth_01258388119638835242_shared&collectionType=Course

Week - 7

7. Demonstrate Spark SQL on Hive
 a.) Create a SQLContext object and load the Parquet file into DataFrame
 b.) Load the Dataframe into Hive table.
 c) Verify the created Hive table in Hive environment
 d.) Execute Spark SQL query.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012609580879003648_551_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Week - 8

8. A Sales Analyst need to analyze 100 million historical sales data stored on Hadoop Data Lake in order to find out their best selling products, most frequently purchasing customers, maximum revenue generated by a product and customer. This analysis would help them to provide offers to customers, find out the best selling product partners. Below is the sample of their sale dataset named as SalesData.csv Schema –
 cust_id, cust_name, cust_email, date, prod_id, prod_name,prod_price

103,john, Bellevue
 102,james, Renton
 101, jayveer, Seattle
 104, Meena, Renton
 105,Marry, Bellevue

Below are the analysis requirements to create a dataset: Below requirements are related to DataFrame creation and working with different file formats category.

Create a Data Frame from the data and write Spark SQL query to compute the average sale of every customer. Store the output as a parquet file.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012609575876583424_540_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Week – 9

9. SPARK SQL query a.) Create a Data Frame from the data and write Spark SQL query to compute and find the most sold product. Store the output as JSON file. b.) Create two DataFrames from the two datasets. Write Spark SQL query to join both and compute - The number of transactions made by customers at "Bellevue" - Compute the total amount of transactions carried by every city

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012609575876583424_540_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Week - 10

10. Char Count - Find and display the number of occurrences of each character in a text file- Spark. 11. Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012608794575314944_278_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Week - 11

11. Perform the filter, count, distinct, map, flatMap RDD Operations in Spark.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012608794575314944_278_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Week - 12

12. Spark joins: Consider a scenario where 2 datasets of a leading retail client to be joined with one another using Spark joins. Customer dataset: Sales dataset: Schema Details: 101 ravi 1 102 keerth 2 101 Syam 1 101 Geetha 1 103 Dawn 3 101 ravi 1 102 keerth 2 101 Syam 1 101 Geetha 1 103 Dawn 3 AR20 Computer Science and Engineering Aditya Engineering College (A) 66 Customer schema (customer id,customer name,product id) Sales Schema (product id,product name and price) Join both datasets with common key Product id and print customer id, customer name, product name and price.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_012617168093_9376641876_shared?collectionId=lex_auth_0126052684230082561692_shared&collectionType=Course

Reference Books:

1. Spark in Action, Marko Bonaci and Petar Zecevic,Manning.
2. PySpark SQL Recipes: With HiveQL, Dataframe and Graphframes, Raju Kumar Mishra and Sundar Rajan Raman,Apress Media.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01256841991858585686_shared/overview
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01258388119638835242_shared/overview
3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0126052684230082561692_shared/overview

MEAN STACK TECHNOLOGIES LAB MODULE – II

(Skill Oriented Course-IV)

VI Semester
Course Code: 201CS6S02

L T P C
0 0 4 2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Build a component-based application using Angular components.
- CO2:** Make use of directives to enhance Angular applications.
- CO3:** Utilize data binding for developing Angular forms and bind them with model data.
- CO4:** Apply Angular built-in or custom pipes to format the rendered data.
- CO5:** Develop a single page application by using synchronous or asynchronous Angular routing.
- CO6:** Make use of MongoDB queries to perform CRUD operations on document database.

Mapping of course outcomes with program outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	1	3	-	-	-	1	2	-	2
CO2	2	2	3	1	2	-	-	-	1	2	-	2
CO3	2	3	2	1	2	-	-	-	1	2	-	2
CO4	2	2	2	1	3	-	-	-	1	2	-	2
CO5	2	2	2	1	3	-	-	-	1	2	-	2
CO6	2	2	3	1	3	-	1	-	1	2	-	2

Mapping of course outcomes with program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

1.a Course Name: Angular JS

Module Name: Angular Application Setup

Observe the link <http://localhost:4200/welcome> on which the mCart application is running. Perform the below activities to understand the features of the application.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24049616594198490000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

1.b Course Name: Angular JS

Module Name: Components and Modules

Create a new component called hello and render Hello Angular on the page.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28217843279641040000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

1.c Course Name: Angular JS

Module Name: Elements of Template

Add an event to the hello component template and when it is clicked, it should change the courseName.

<https://infyspringboard.onwingspan.com/web/en/viewer/web->

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_19226434057992030000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

- 1.d **Course Name:** Angular JS
Module Name: Change Detection
Progressively building the PoolCarz application
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2560981637120771000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 2.a **Course Name:** Angular JS
Module Name: Structural Directives - ngIf
Create a login form with username and password fields. If the user enters the correct credentials, it should render a "Welcome <>username<>" message otherwise it should render "Invalid Login!!! Please try again..." message
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637402260439042595_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 2.b **Course Name:** Angular JS
Module Name: ngFor
Create a courses array and rendering it in the template using ngFor directive in a list format.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32795774277593590000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 2.c **Course Name:** Angular JS
Module Name: ngSwitch
Display the correct option based on the value passed to ngSwitch directive.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_23388127475984175000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 2.d **Course Name:** Angular JS
Module Name: Custom Structural Directive
Create a custom structural directive called 'repeat' which should repeat the element given a number of times.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24073319904331424000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 3.a **Course Name:** Angular JS
Module Name: Attribute Directives - ngStyle
Apply multiple CSS properties to a paragraph in a component using ngStyle.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24037156998765367000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 3.b **Course Name:** Angular JS
Module Name: ngClass
Apply multiple CSS classes to the text using ngClass directive.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3459610297074182000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 3.c **Course Name:** Angular JS
Module Name: Custom Attribute Directive
Create an attribute directive called 'showMessage' which should display the given message in a paragraph when a user clicks on it and should change the text color to red.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_14783742359773809000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 4.a **Course Name:** Angular JS

Module Name: Property Binding

Binding image with class property using property binding.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_8951964709153619000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

4.b Course Name: Angular JS**Module Name:** Attribute Binding

Binding colspan attribute of a table element to the class property.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7154252883180625000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

4.c Course Name: Angular JS**Module Name:** Style and Event Binding

Binding an element using inline style and user actions like entering text in input fields.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_7417401021103822000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.a Course Name: Angular JS**Module Name:** Built in Pipes

Display the product code in lowercase and product name in uppercase using built-in pipes.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_11810543990912035000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.b Course Name: Angular JS**Module Name:** Passing Parameters to Pipes

Apply built-in pipes with parameters to display product details.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_21187073707540988000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

5.c Course Name: Angular JS**Module Name:** Nested Components Basics

Load CourseslistComponent in the root component when a user clicks on the View courses list button.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24231999287700136000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.a Course Name: Angular JS**Module Name:** Passing data from Container Component to Child Component

Create an AppComponent that displays a dropdown with a list of courses as values in it. Create another component called the CoursesList component and load it in AppComponent which should display the course details. When the user selects a course from the dropdown, corresponding course details should be loaded.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_15758356947336235000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

6.b Course Name: Angular JS**Module Name:** Passing data from Child Component to ContainerComponent

Create an AppComponent that loads another component called the CoursesList component. Create another component called CoursesListComponent which should display the courses list in a table along with a register .button in each row. When a user clicks on the register button, it should send that courseName value back to AppComponent where it should display the registration successful message along with courseName.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2494980689916818400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

- 6.c** **Course Name:** Angular JS
Module Name: Shadow DOM
 Apply ShadowDOM and None encapsulation modes to components.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10312243404892470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 6.d** **Course Name:** Angular JS
Module Name: Component Life Cycle
 Override component life-cycle hooks and logging the corresponding messages to understand the flow.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 7.a** **Course Name:** Angular JS
Module Name: Template Driven Forms
 Create a course registration form as a template-driven form.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2810668513603024400_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 7.b** **Course Name:** Angular JS
Module Name: Model Driven Forms or Reactive Forms
 Create an employee registration form as a reactive form.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33704702617536004000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 7.c** **Course Name:** Angular JS
Module Name: Custom Validators in Reactive Forms
 Create a custom validator for an email field in the employee registration form (reactive form).
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_33728128192769250000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 8.a** **Course Name:** Angular JS
Module Name: Custom Validators in Template Driven forms
 Create a custom validator for the email field in the course registration form.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_27688491925133280000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 8.b** **Course Name:** Angular JS
Module Name: Services Basics
 Create a Book Component which fetches book details like id, name and displays them on the page in a list format. Store the book details in an array and fetch the data using a custom service.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_32584403823635940000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 8.c** **Course Name:** Angular JS
Module Name: RxJS Observables
 Create and use an observable in Angular.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_6209609363905256000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course
- 9.a** **Course Name:** Angular JS
Module Name: Server Communication using HttpClient
 Create an application for Server Communication using HttpClient
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10818939635948007000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_0127637395317063682615_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

9.b Course Name: Angular JS

Module Name: Communicating with different backend services using Angular HttpClient

Create a custom service called ProductService in which Http class is used to fetch data stored in the JSON files.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_426633361795059700_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.a Course Name: Angular JS

Module Name: Routing Basics, Router Links

Create multiple components and add routing to provide navigation between them.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3782024852517635000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.b Course Name: Angular JS

Module Name: Route Guards

Considering the same example used for routing, add route guard to BooksComponent. Only after logging in, the user should be able to access BooksComponent. If the user tries to give the URL of Bookscomponent in another tab or window, or if the user tries https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_30303325731876470000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.c Course Name: Angular JS

Module Name: Asynchronous Routing

Apply lazy loading to BookComponent. If lazy loading is not added to the demo, it has loaded in 1.14 s. Observe the load time at the bottom of the browser console. Press F12 in the browser and click the Network tab and check the Load time.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9878739890118246000_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

10.d Course Name: Angular JS

Module Name: Nested Routes

Implement Child Routes to a submodule.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012768043900444672140_shared?collectionId=lex_20858515543254600000_shared&collectionType=Course

11.a Course Name: MongoDB Essentials - A Complete MongoDB Guide

Module Name: Installing MongoDB on the local computer, Create MongoDB Atlas Cluster

Install MongoDB and configure ATLAS

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821437313024030083_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

11.b Course Name: MongoDB Essentials - A Complete MongoDB Guide

Module Name: Introduction to the CRUD Operations

Write MongoDB queries to perform CRUD operations on document using insert(), find(), update(), remove()

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821874166169630118_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

12.a Course Name: MongoDB Essentials - A Complete MongoDB Guide

Module Name: Create and Delete Databases and Collections

Write MongoDB queries to Create and drop databases and collections.

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_01281821654119219230121_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

12.b Course Name: MongoDB Essentials - A Complete MongoDB Guide**Module Name:** Introduction to MongoDB Queries

Write MongoDB queries to work with records using find(), limit(), sort(), createIndex(), aggregate().

https://infyspringboard.onwingspan.com/web/en/viewer/video/lex_auth_0132890816264519682505_shared?collectionId=lex_auth_013177169294712832113_shared&collectionType=Course

Reference Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview
(Angular JS)
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview
(MongoDB)

EMPLOYABILITY SKILLS (Common to CSE, IT, AIML Branches)

VI Semester
Course Code: 201MC6T02

L	T	P	C
2	0	0	0

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Solve the problems on Time & Work, Time & Distance by simple methods.
- CO2:**Derive the conclusions, assumptions and arguments from the available information.
- CO3:**Write technical reports and emails for professional communication.
- CO4:**Solve problems on Permutations & Combination, Probability.
- CO5:**Participate confidently in a formal discussion and present themselves effectively.
- CO6:**Comprehend the techniques of skimming and scanning for effective communication.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO6	-	1	-	-	-	-	-	-	1	1	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	3
CO4	-	2
CO5	-	3
CO6	-	2

UNIT-I:

Aptitude: Time and Work, Pipes and Cisterns: Problems based on basic concept, wages, alternate days, chain rule.

Soft Skills: Sentence Re-arrangement: Ordering the words in a sentence, ordering the sentences of a context, arranging the sentences when first and last sentence were given.

UNIT-II:

Aptitude:Syllogisms: Problems based on 2, 3, 4 statements, positive conclusions, negative conclusions, complimentary pairs and possibility cases.

Soft Skills:Email Writing, Writing Skills: Formal correspondence through email and cover letter writing. Report writing and paragraph writing tips.

UNIT-III:

Aptitude:Time and Distance, Boats and streams: Problems based on basic concept, average speed, relative speed, trains concept and application of the knowledge of time speed distance on solving the questions of boats and streams.

Soft Skills:Error Detection and Correction: Tips to identify the grammatical errors while using the parts of speech, tenses, subject- verb-agreement.

UNIT-IV:

Aptitude:Seating Arrangement, Critical Reasoning: Practice problems to improve the analytical skills, Statements and conclusions, Statements and Arguments, Statements and Assumptions, Statements and course of action.

Soft Skills:Presentation Skills, Resume Building: Tips to make effective presentations using different resources. Dealing with nervousness, tips to improve confidence, pitch, body language, grooming. How to write an impressive resume.

UNIT-V:

Aptitude:Permutations and Combinations, Probability: Linear and circular permutation, practical examples for the application of permutation and combinations. The usage of probability concepts to find the chances of occurring of an event.

Soft Skills:Reading Comprehension: How to read and comprehend a passage by using different techniques like Skimming, Scanning etc. Dos and don'ts while solving the reading comprehension.

Text Books:

1. Quantitative Aptitude –Dr. R. S. Aggarwal, S CHAND.
2. A Modern Approach to Verbal and Non-Verbal Reasoning – Dr. R. S. Aggarwal.
3. Quick Learning Objective General English – Dr. R. S. Aggarwal, S CHAND.

Reference Books:

1. Quantitative Aptitude – Abhijit Guha Mc Graw Hill Publications.
2. Analytical Reasoning – Jaikishan and Premkishan Arihant Publications.
3. A New Approach to Objective English – R. S. Dhillon DGP Publications.

Web Links:

1. www.indiabix.com
2. www.bankersadda.com

PROFESSIONAL ETHICS AND HUMAN VALUES
Common to all branches

VISemester
Course Code:201MC6T01

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Make use of values, morals and ethics in their day to day life.
- CO2:** Identify what is right and wrong through moral ethics.
- CO3:** Analyze experimental learning while developing the society with ethics.
- CO4:** Apply ethical principles to resolve the problems that arise in work place.
- CO5:** Apply adequate knowledge on global code of conduct.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	3	-	2	-	1
CO2	-	-	-	-	-	-	-	3	2	-	-	1
CO3	-	-	-	-	-	-	-	3	-	2	-	1
CO4	-	-	-	-	-	-	-	3	-	2	-	1
CO5	-	-	-	-	-	-	-	3	2	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5		

Unit - I

Human Values: Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment – Empathy – Self confidence – Spirituality- Character

Unit – II

Principles for Harmony: Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

Unit – III

Engineering Ethics and Social Experimentation: History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument – Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering

Unit – IV

Engineers’ Responsibilities towards Safety and Risk: Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis Accidents.

Unit – V

Engineers' Duties and Rights: Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving-Occupational Crimes- Industrial Espionage- Price Fixing- Whistle Blowing Globalization and MNCs –Cross Culture Issues.

Text Books:

1. A Text Book On Professional Ethics And Human – R.S.Naagarazan.
2. Professional Ethics And Human Values By – M.P.Raghavan's – Scitech Publications (Indian Pvt., 2013).

Reference Books:

1. Engineering Ethics & Human Values By M.Govindarajan, S.Natarajan And V.S.Senthil Kumar-PHI Learning Pvt. Ltd – 2009.
2. Human Values And Professional Ethics By Jayshree Suresh And B. S. Raghavan, S.Chand Publications
3. Professional Ethics And Human Values By Prof.D.R.Kiran-Tata Mcgraw-Hill – 2014
4. Engineering Ethics By Harris, Pritchard And Rabins, Cengage Learning, New Delhi.

Web Links:

1. <https://nptel.ac.in/courses/109104068>
2. <https://www.reelnreel.com/roles-and-responsibilities-of-a-typical-video-engineer/>
3. <http://nptel.ac.in/courses/109104068/30>
4. http://nptel.ac.in/courses/122106031/Pdfs/2_1.pdf

REINFORCEMENT LEARNING (Honors)

VI Semester
Course Code:201CS6H01

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Explain how to define RL tasks and the core principals behind the RL, including policies, value functionsderiving Bellman equations and code standards and libraries
- CO2:** Apply tabular methods to solve classical control problems and Optimization problems
- CO3:** Describe the policy gradient methods from vanilla to more complex cases
- CO4:** Explore imitation learning tasks and solutions
- CO5:** Recognize current advanced techniques and applications in RL.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	1	3	-	2	-	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	-	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	1	-
CO3	2	-
CO4	1	-
CO5	2	-

Unit - I

Reinforcement Learning Problem: Introduction, Elements of Reinforcement Learning, Limitations and Scope, Tic-Tac-Toe, Multi-arm Bandits: n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandit, Associative Search.

Unit – II

Finite Markov Decision Processes: Agent-Environment Interface, Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation, Dynamic Programming: Policy- Evaluation, Improvement, Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming.

Unit – III

Monte Carlo Methods: Monte Carlo- Prediction, Estimation of Action Values, Control, Control without Exploring Start, Temporal- Difference learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), Sarsa: On-Policy TD Control, Q-Learning, Games, Afterstates.

Unit – IV

Eligibility Traces: n-Step TD Prediction, Forward and Backward View of TD(λ), Equivalences of Forward and Backward Views, sarsa(λ), Watkin's Q(λ), Off-policy Eligibility Traces using Important Sampling, Variable λ

Unit – V

Planning and Learning with Tabular Methods: Models and Planning, Integrating Planning, Acting and Learning, Prioritized Sweeping, Full vs. Sample Backups, Trajectory Sampling, Heuristic Search, Monte Carlo Tree Search.

Text Books:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019.
2. Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, Reinforcement Learning Algorithms: Analysis and Applications, 1st Edition, Springer, 2021

Reference Books:

1. Li, Yuxi. "Deep reinforcement learning." arXiv preprint arXiv:1810.06339 (2018).
2. Wiering, Marco, and Martijn Van Otterlo. "Reinforcement learning." Adaptation, learning, and optimization 12 (2012): 3.
3. Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach." Pearson Education Limited, 2016.
4. Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning." MIT press, 2016.

Web Links:

1. <https://www.coursera.org/specializations/reinforcement-learning>
2. <https://online.stanford.edu/courses/xcs234-reinforcement-learning>
3. <https://www.udemy.com/topic/reinforcement-learning/>
4. <https://www.udemy.com/course/deep-reinforcement-learning/>

**INFORMATION SECURITY ANALYSIS AND AUDIT
(Honors)**

VI Semester
Course Code:201CS6H02

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Contribute to managing information security and information security audits
- CO2:** Co-ordinate responses to information security incidents
- CO3:** Install and configure information security devices
- CO4:** Support teams to prepare for and undergo information security audits
- CO5:** Maintain a healthy, safe and secure working environment
- CO6:** Provide data/information in standard formats

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	-	-	-	-	-	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-
CO3	2	2	1	2	-	-	-	-	-	-	-	-
CO4	2	2	2	2	-	-	-	-	-	-	-	-
CO5	1	1	1	-	-	-	-	-	-	-	-	-
CO6	2	2	2	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	3
CO2	-	3
CO3	-	3
CO4	-	2
CO5	-	2
CO6	-	2

Unit - I

Overview of Information System Auditing- Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

Unit – II

The management Control Framework-I- Introduction, Evaluating the planning Function, Leading Function, Controlling Function, Systems Development Management Controls, Approaches to Auditing Systems Development, Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

Unit – III

The Management Control Framework-II- Security Management Controls, Operations management Controls Quality assurance Management Controls, Case Studies.

Unit – IV

Evidence Collection- Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

Unit – V

Evidence Evaluation- Evaluating Asset Safeguarding and Data Integrity, Evaluating System, Effectiveness, Evaluating System Efficiency, Information Systems Audit and Management: Managing the Information Systems Audit Function.

Text Books:

1. William Stallings, Lawrie Brown, Computer Security: Principles and Practice, 3rd edition, 2014.
2. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wiley, 2017
3. Nina Godbole, SunitBelapure, Cyber Security- Understanding cyber-crimes, computer forensics and legal perspectives, Wiley Publications, 2016
4. Andrew VladimirovMichajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly, 2010

Reference Books:

1. Charles P. Pfleeger, Security in Computing, 4th Edition, Pearson, 2009.
2. Christopher J. Alberts, Audrey J. Dorofee , Managing Information Security Risks, Addison-Wesley Professional, 2004
3. Peter Zor, The Art of Computer Virus Research and Defense, Pearson Education Ltd, 2005
4. Lee Allen, Kevin Cardwell, Advanced Penetration Testing for Highly-Secured Environments - Second Edition, PACKT Publishers, 2016
5. Chuck Easttom , System Forensics Investigation and Response, Second Edition, Jones & Bartlett Learning, 2014

Web Links:

1. <https://www.udemy.com/course/iso-27001-lead-auditor-course/>
2. <https://nccs.cisa.gov/education-training/catalog/devry-university/information-systems-security-planning-and-audit>
3. <https://www.coursera.org/learn/information-systems-audit>
4. <https://classroom.udacity.com/courses/ud459>

OPERATING SYSTEMS (Minor)

VISemester
Course Code:201CS6M01

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Illustrate the basic structure, services, system calls and architectural components of Operating Systems.
- CO2:** Analyze various Process Scheduling algorithms and Multi threading models.
- CO3:** Demonstrate Inter Process Communication between the processes and deadlocks.
- CO4:** Make use of paging, segmentation and virtual memory strategies to allocate memory for the process.
- CO5:** Describe the concepts of file system implementation, disk management, Protection and security for system.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	1	2	3	1	-	-	-	-	-	-	-	-
CO4	1	1	1	3	-	-	-	-	-	-	-	-
CO5	1	1	3	1	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit – I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, System Boot.

Unit – II

Process Concept: Process scheduling, Operations on processes, Inter-process communication.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Unit – III

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

Unit – IV

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

File Systems: Files, Directories, File system implementation, management and optimization.

Unit – V

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats.

Case Studies: Linux, Microsoft Windows.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter B Galvin and Greg Gagne,9th Edition, John Wiley and Sons Inc., 2013.
2. Modern Operating Systems, Tanenbaum A S, 3rd edition, Pearson Education, 2008.

Reference Books:

1. Operating Systems A Concept Based Approach, Dhamdhere D M, 3rd edition, Tata McGraw-Hill, 2012.
2. Operating Systems -Internals and Design Principles, Stallings W, 6th edition, Pearson Education, 2009.
3. Operating Systems, Nutt G, 3rd edition, Pearson Education, 2004.

Web Links:

1. <http://nptel.ac.in/downloads/106108101/>
2. <https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems>
3. <http://www.geeksforgeeks.org/operating-systems/>
4. <https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923>

WEB TECHNOLOGIES
(Minor)

VISemester
Course Code:201CS6M02

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Develop static web pages using HTML and CSS.
- CO2:** Apply JavaScript for Client side validations and Node.JS to learn server side applications using JavaScript.
- CO3:** Make use of Angular JS for developing dynamic and responsive web pages.
- CO4:** Utilize React JS for developing dynamic and responsive web pages.
- CO5:** Create and deploy secure, usable database driven web applications using PHP and MySQL/MongoDB.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	-	-	-	-	-	-	-	-
CO2	2	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	3	-	2	-	-	-	-	-	-	-
CO4	2	-	2	-	2	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit – I

HTML, HTML5, CSS, CSS3 HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML Media, Iframes, Images, Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML. CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, Box Model, Conflict Resolution, CSS3.

Unit – II

JavaScript & XML Javascript - Introduction, Primitives, Variables – var, let, const, Operations and Expressions, Control Statements, Functions, Objects (Predefined - String, Number, Array, Date, Math, Random, RegExp, User Defined – Definition, Properties, Methods, Display, Accessors, Constructors), Events, Pattern Matching using Regular Expressions, Working with XML: Document type Definition (DTD), XML schemas, XSLT, XML and CSS, Document object model, Parsers - DOM and SAX.

Unit – III

Node JS & Angular JS Node.js- Introduction, Advantages, Process Model, Modules, HTTP Module, File system, URL module, NPM, Events, Upload Files, Email. Angular JS – Introduction, Expressions, Modules, Directives, Model, Data Binding, Controllers, Scopes, Filters, Services, HTTP, Tables, Select, Events, Forms, Validation, API, W3.CSS, Includes, Routing, SQL, DOM, Application.

Unit – IV

React JS React JS – Introduction, Displaying “Welcome React”, Introducing JSX, Rendering Elements, Components and Props, State and Lifecycle, Handling Events, Conditional Rendering, Lists and Keys, Forms, Lifting State Up, Composition vs Inheritance, Thinking in React.

Unit – V

PHP PHP Programming - Introduction, Creating and Running PHP Script. Variables, Constants, DataTypes, Operators. Controlling Program Flow - Conditional and Loop statements, Arrays, Functions, Client-Server Scripting – XAMPP/LAMP Introduction, Running PHP Script in XAMPP, Super Globals, Working with Form Data, Database Connectivity – MySQL Introduction using XAMPP in Command Mode and GUI, Working with MySQL Queries, Integrating PHP and MySQL to work with Form Data. No SQL Database - MongoDB Introduction, Create and Drop Database, Create and Drop Collection, Data Types, Insert, Query, Update, Delete, Integrating PHP with MongoDB.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly.
3. React Explained, 2020 Edition, Zac Gordon, OSTraining.
4. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O'Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech.
2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning.

Web Links:

1. <https://www.w3schools.com/> (html, css, js, xml, nodejs, angular, react, php)
2. <https://www.angular.io/docs>
3. <https://www.reactjs.org/docs/getting-started.html>
4. <https://www.university.mongodb.com/>

INTRODUCTION TO R PROGRAMMING (Minor)

VISemester	L	T	P	C
Course Code: 201CS6M03	3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Illustrate the basic concepts and advanced data structures of R programming.
- CO2:** Explain the control statements and operators in R.
- CO3:** Implement simulation, Probability and linear algebra operations.
- CO4:** Make use of graph functions for better visualization of results.
- CO5:** Develop programs for distribution functions and regression models.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	1	-	-	-	-	-	-	-
CO2	3	2	-	-	1	-	-	-	-	-	-	-
CO3	2	3	2	-	2	-	-	-	-	-	-	-
CO4	2	2	3	-	2	-	-	-	-	-	-	-
CO5	2	3	2	-	2	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit – I

Introduction: How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

Unit – II

R Programming Structures: Control Statements, Loops, - Looping Over Nonvector Sets, If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return

Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended

Example: A Binary Search Tree.

Unit – III

Simulation in R: Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution,

Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set

Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

Unit – IV

Graphics: Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

Unit – V

Probability Distributions: Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,- ANOVA, Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression.

Text Books:

1. The Art of R Programming, Norman Matloff, 1st Edition, Cengage Learning, 2011.
2. R for Everyone, Lander, 2nd Edition, Pearson, 2018.

Reference Books:

1. R Cookbook, J.D.Long & Paul Teator, 2nd Edition, Oreilly, 2019
2. R in Action, Rob Kabacoff, 2nd Edition, Manning, 2015.

Web Links:

1. <https://www.geeksforgeeks.org/introduction-to-r-programming-language/>
2. <https://www.udacity.com/course/data-analysis-with-r--ud651>

**DATA SCIENCE
(Professional Elective-III)
Common to CSE&IT**

VII Semester
Course Code: 201CS7E01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Illustrate the basic concepts of python for data analysis
- CO2:** Analyze the need for data preprocessing and visualization techniques.
- CO3:** Describe Descriptive statistics to explore on data
- CO4:** Use appropriate machine learning algorithms to solve given problem.
- CO5:** Analyze datasets using clustering and recommender systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	1	-	-	-	-	-	-	1
CO2	2	2	2	-	1	-	-	-	-	-	-	-
CO3	2	2	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	2	1	-	-	-	-	-	-	2
CO5	2	2	2	2	2	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit - I

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Scenester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries default dict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object- Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kw args, Type Annotations, How to Write Type Annotations.

Unit - II

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation. Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

Unit - III

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs, Working with Data: Exploring Your DataUsingNamedTuples, Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

Unit – IV

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression

Unit – V

Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection, I Python, Mathematics, NumPy, pandas, scikit-learn, Visualization.

Text Books:

1. Allen B. Downey, "Think Stats", O'Reilly
2. Joel Grus, "Data Science from Scratch", O'Reilly

Reference Books:

1. Doing Data Science: Straight Talk from The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly.
2. Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press.
3. "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth Matsui, Lean Publications.
4. "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, Springer Publications.

Web Links:

1. <https://github.com/joelgrus/data-science-from-scratch>
2. <https://github.com/donnemartin/data-science-ipython-notebooks>
3. <https://github.com/academic/awesome-datascience>

CLOUD COMPUTING
(Professional Elective-III)
Common to CSE&IT

VII Semester

Course Code: 201CS7E02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Describe the fundamentals of cloud computing
- CO2:** Analyze types of cloud infrastructures and its applications.
- CO3:** Demonstrate the concepts of virtualization, cloud resource management and scheduling.
- CO4:** Classify various storage systems and models in cloud computing environment.
- CO5:** Analyze the cloud security risks and mechanisms.
- CO6:** Utilize cloud environment platform and tools for developing cloud-based applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	2	-	1	-	1	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	-	2
CO3	-	1
CO4	1	-
CO5	2	-
CO6	-	2

Unit - I

Introduction to Cloud computing: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, Challenges of cloud computing, Characteristics, Cloud computing applications and security risks.

Unit - II

Virtualization and Virtualization of clusters and datacenters: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Unit - III

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure.

Unit - IV

Cloud Resource management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two-Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

Unit – V

storage systems:Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. DistributedSystems-ConceptsandDesign,GeorgeCoulouris,JeanDollimore,Tim Kindberg, 4th Edition, Pearson Publication.

Reference Books:

1. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press.
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH.
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview
3. <https://www.javatpoint.com/cloud-computing-tutorial>
4. https://www.tutorialspoint.com/cloud_computing/index.htm

DISTRIBUTED SYSTEMS
(Professional Elective-III)
Common to CSE&IT

VII Semester
Course Code: 201CS7E03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Explain foundations and issues of distributed systems.
- CO2:** Illustrate the various synchronization issues and global state for distributed systems.
- CO3:** Analyze the Mutual Exclusion and Deadlock detection algorithms in distributed systems.
- CO4:** Explain the agreement protocols and fault tolerance mechanisms in distributed systems.
- CO5:** Describe the features of peer-to-peer and distributed shared memory systems.
- CO6:** Summarize the process coordination, failure recovery algorithms.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	-	-	-	-	-	-	-	-
CO2	2	3	1	2	-	-	-	-	-	-	-	1
CO3	3	3	1	2	-	-	-	-	-	-	-	-
CO4	3	1	1	1	-	-	-	-	-	-	-	-
CO5	3	1	1	1	-	-	-	-	-	-	-	1
CO6	3	2	1	1	-	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	1	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit – I

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.Logical Time: A framework for a system of logical clocks, Scalar time, Vector time,Physical clock synchronization: NTP.

Unit – II

Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

Unit – III

Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport's algorithm, Ricart-Agrawala algorithm, Maekawa's algorithm, Suzuki-Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp's classification, Algorithms for the single resource model, the AND model and the OR model.

Unit – IV

Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery.

Unit – V

Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure-free system, Agreement in synchronous systems with failures. Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord distributed hash table, Content addressable networks, Tapestry.

Text Books:

1. Distributed Computing, Principles, Algorithms and Systems, Ajay DKshemkalyani, Mukesh Sighal, Cambridge, University Press.
2. Distributed Systems- Concepts and Design, George Coulouris, Jean Dollimore, Tim Kindberg, 4th Edition, Pearson Publication.

Reference Books:

1. Distributed Computing – Principles and Applications, M.L. Liu, Addison Wesley, Pearson Education.
2. Distributed Systems- Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education
3. Distributed Computing: Fundamentals, Simulations and Advanced Topics, Hagit Attiya and Jennifer Welch, Wiley.

Web Links:

1. nptel.ac.in/courses/106106168/
2. <http://db.uwaterloo.ca/~tozsu/courses/cs454>
3. <http://cse.iitkgp.ac.in/~agupta/distsys/index.html>
4. <http://www.cis.upenn.edu/~lee/03cse380/lectures/ln19-ds-v3.4pp.pdf>

CYBER SECURITY AND FORENSICS
(Professional Elective-III)
Common to CSE&IT

VII Semester
Course Code: 201CS7E04

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Illustrate the fundamental knowledge on protecting computer systems & safeguarding Networking activities.
- CO2:** Distinguish type of tools and methods used in cyber crimes.
- CO3:** Analyze various tools available for Cybercrime Investigation.
- CO4:** Demonstrate the Computer Forensics and Investigation Fundamentals and tools.
- CO5:** Analyze the legal perspectives of Cybercrime.
- CO6:** Explain the information technology amendments and sections related to cyber security.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	2	-	-	2	-	-	-	1
CO2	1	2	-	3	1	-	-	-	-	-	-	2
CO3	1	3	2	-	1	-	-	-	-	-	-	2
CO4	3	2	-	2	2	-	-	-	-	-	-	2
CO5	1	3	2	-	1	-	-	-	-	-	-	2
CO6	3	1	-	-	1	-	-	1	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	-	-
CO3	-	1
CO4	-	-
CO5	-	2
CO6	1	2

Unit – I

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origin of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyber stalking, Cybercafe and Cybercrimes, Botnets, Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

Unit – II

Tools and Methods: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking, Buffer overflow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

Unit – III

Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

Unit – IV

Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

Unit – V

Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Text Books:

1. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.
2. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

Reference Books:

1. Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage, 2018.

Web Links:

1. <https://www.nist.gov/cybersecurity>
2. <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks>
3. <https://computersecurity.stanford.edu/free-online-video> [Free Online Videos]
4. CERT-In Guidelines- <http://www.cert-in.org.in/>

**COMPUTER VISION
(Professional Elective-IV)
Common to CSE&IT**

VII Semester
Course Code: 201CS7E05

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Identify basic concepts, terminology, theories, models and methods in the field of computer vision.
- CO2:** Describe known principles of feature detection and matching
- CO3:** Discuss the importance of structure and motion techniques in computer vision.
- CO4:** Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal
- CO5:** Design a computer vision system for a 3D Reconstruction, Albedos.
- CO6:** Evaluate image based rendering views and depths.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	-	-	-	-	-	-	-	2
CO2	2	2	1	3	-	-	-	-	-	-	-	1
CO3	2	3	2	1	-	-	-	-	-	-	-	1
CO4	2	3	2	1	-	-	-	-	-	-	-	-
CO5	2	2	3	1	-	-	-	-	-	-	-	1
CO6	2	3	2	2	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	1	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	1	1

Unit – I

Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.

Unit – II

Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.

Unit – III

Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

Unit – IV

Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

Unit – V

3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.

Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick& Shapiro, “Computer and Robot Vision”, Vol II
3. G_erardMedioni and Sing Bing Kang “Emerging topics in computer vision”

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview
3. <https://www.javatpoint.com/computer-vision-tutorial>
4. <https://www.tutorialspoint.com/computer-vision/index.htm>

SOCIAL NETWORKS AND SEMANTIC WEB
(Professional Elective-IV)
Common to CSE&IT

VII Semester
Course Code: 201CS7E06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Summarize the concepts of semantic web and social network analysis.
- CO2:** Describe the knowledge representation on the Semantic web.
- CO3:** Make use of ontology engineering in social networks.
- CO4:** Identify the architectures and challenges in building social networks.
- CO5:** Compare various survey methods of social networks.
- CO6:** Analyze the performance of social networks using electronic sources.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	-	-	-	-	-	-	-	1
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	1
CO4	2	2	3	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	2	2	-	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	1
CO2	-	1
CO3	-	2
CO4	-	1
CO5	-	1
CO6	-	2

Unit – I

Web Intelligence: Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

Unit – II

Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web – Resource Description Framework (RDF) / RDF Schema, Ontology Web Language (OWL), UML, XML/XMLSchema.

Unit – III

Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

Unit – IV

Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base, XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods.

Unit – V

Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.

Text Books:

1. Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

Reference Books:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O'Reilly, SPD.

Web Links:

1. <https://www.w3.org/standards/semanticweb/>
2. <https://www.javatpoint.com/ai-techniques-of-knowledge-representation>
3. <https://tinyurl.com/hhywdjx8>
4. <https://open.hpi.de/courses/semanticweb>
5. <https://core.ac.uk/download/pdf/36753454.pdf>

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
(Professional Elective-IV)
Common to CSE&IT

VII Semester
Course Code: 201CS7E07

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Analyze architectural styles and patterns.
- CO2:** Evaluation and finalization of architecture design documentation
- CO3:** Explain the pattern sections with appliance of creational
- CO4:** Apply structural patterns for real time applications.
- CO5:** Apply behavioral patterns for real time applications.
- CO6:** Explain user interface design for real time applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	3	2	-	-	-	-	-	-	2
CO2	2	2	3	2	2	-	-	-	-	-	-	1
CO3	2	1	1	1	3	-	-	-	-	-	-	1
CO4	2	3	-	2	2	-	-	-	-	-	-	2
CO5	2	3	1	1	2	-	-	-	-	-	-	2
CO6	2	2	2	1	3	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
CO6	2	-

Unit – I

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views. Creating and Architecture Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

Unit – II

Architecture Evaluation, Architecture design decision making, Building systems from off the shelf components, Software architecture in future.

Unit – III

Patterns Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage. Creational Patterns: Abstract factory, Builder, Factory method, Prototype, Singleton

Unit – IV

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, PROXY

Unit – V

Behavioral Patterns: Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor. A Case Study (Designing a Document Editor): Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

Text Books:

1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

Reference Books:

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003.
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.

Web Links:

1. <https://nptel.ac.in/courses/106105224>
2. <https://www.javatpoint.com/designpatterns>
3. <https://tinyurl.com/hhywdjx8>
4. <https://core.ac.uk/download/pdf/36753454.pdf>

DEEP LEARNING TECHNIQUES
(Professional Elective-V)
Common to CSE&IT

VII Semester
Course Code: 201CS7E08

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Summarize basic principles behind neural networks and deep learning
- CO2:** Compare modelling aspects of Neural Network Architectures
- CO3:** Build a CNN using different activation functions
- CO4:** Apply deep learning algorithms to solve complex problems

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	-	-	-	-	-	-	-	-
CO2	2	2	-	2	1	-	-	-	-	-	-	-
CO3	2	2	2	1	1	-	-	-	-	-	-	-
CO4	2	2	2	1	1	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	-
CO4	-	2

Unit – I

Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, Fundamentals of Machine Learning: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting.

Unit – II

Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks.

Unit – III

Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification.

Unit – IV

Convolutional Neural Networks: Neral Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch.

Unit – V

Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. [Text Book 1]

Deep Learning Research: Autoencoders, Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks.

Text Books:

1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
4. Neural Networks and Deep Learning, Charu C. Aggarwal, Springer

Reference Books:

1. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009
2. Matrix Computations, Golub, G.H., and Van Loan,C.,F, JHU Press,2013.
3. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs22/preview
2. <https://keras.io/datasets/>
3. https://onlinecourses.nptel.ac.in/noc19_cs85/preview
4. <http://deeplearning.net/tutorial/deeplearning.pdf>
5. <https://arxiv.org/pdf/1404.7828v4.pdf>

BLOCK-CHAIN TECHNOLOGIES
(Professional Elective-V)
Common to CSE&IT

VII Semester
Course Code: 201CS7E09

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Demonstrate the blockchain and crypto currency basics
- CO2:** Compare and contrast permissioned and permissionless blockchains
- CO3:** Explain different types of crypto currency wallets
- CO4:** Explain how to compile and deploy smart contracts using Etherium
- CO5:** Summarize Hyperledger fabric architecture and different use cases
- CO6:** Illustrate use cases of block chain technologies.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	2
CO2	2	3	1	2	-	-	-	-	-	-	-	2
CO3	2	3	1	1	-	-	-	-	-	-	-	2
CO4	2	2	3	2	-	-	-	-	-	-	-	2
CO5	2	2	3	2	-	-	-	-	-	-	-	2
CO6	3	2	-	2	2	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	3
CO5	-	3
CO6	-	2

Unit – I

Introduction: Introduction: Overview of Block chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet , Digital Currency, Ledgers, Types of Blockchain Platforms

Unit – II

Consensus Mechanism: Permissioned Blockchain, Permissionless Blockchain, Different Consensus Mechanisms- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance

Unit – III

Crypto currency and Wallet: Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating an account in Metamask, Use of faucet to fund wallet, transfer of cryptocurrency in metamask.

Unit – IV

Smart contract and Ethereum: Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE , Different networks of ethereum, understanding blocks practically at blockhcain.com, how to compile and deploy smart contract in remix.

Unit – V

Understanding Hyperledger Fabric: Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contracts using Hyperledger Fabric. Use Cases: Cross border payments, Know Your Customer (KYC), Food Security, Block chain enabled Trade.

Text Books:

1. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly
2. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashier, Packt publishing

Reference Books:

1. Mastering Ethereum: Building Smart Contracts and DApps by Andrews
2. Mastering Bitcoin: Programming the Open Blockchain, by Andreas M. Antonopoulos, O'Reilly

Web Links:

1. https://onlinecourses.swayam2.ac.in/aic21_ge01/
2. <https://github.com/blockchainedindia/resources>
3. <https://github.com/HyperledgerHandsOn/trade-finance-logistics>

AGILE METHODOLOGIES
(Professional Elective-V)
Common to CSE&IT

VII Semester
Course Code: 201CS7E10

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Summarize the life cycle & principles of agile software development.
- CO2:** Describe the fundamentals of Devops.
- CO3:** Develop a project using Scrum
- CO4:** Explain the roles of Scrum Master and Product owner
- CO5:** Explain the team review meeting about the project.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	-	-	-	-	-	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	2	-
CO3	2	2	3	-	-	-	-	-	-	-	2	2
CO4	2	2	1	-	-	-	-	-	-	-	1	2
CO5	2	2	2	-	-	-	-	-	-	-	1	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit – I

Agile Software Development Ecosystems: SCRUM, Dynamic System Development Method, Crystal, Feature Driven Development, Lean Development, Extreme Programming, Adaptive Software Development.

Unit – II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

Unit – III

Backdrop-The Science of Scrum: The Skelton and Heart of Scrum, Scrum Roles, Scrum Flow, Scrum Artifacts New Management Responsibilities: The Scrum Master at Meta Eco, The Product Owner at Mega Energy, The team at Service 1st. The Scrum Master: The Untrained Scrum Master at Trey Research, The Untrained Scrum Master at Lit Ware.

Unit – IV

The Product Owner: Customer and team Collaboration, Getting Service 1st Management Back in Action, Fixing the problem of X flow at Mega fund, Company Goals at Techcore, Company Goals at Mega Bank Fund Transfer System Planning A Scrum Project: Managing Cash at Mega Bank, Certified Scrum Masters Take on Return on Investment.

Unit – V

The Team: Team Formation at Service 1ST, Giving the team a Chance at Web New Site. Scaling the Project with Scrum: Scaling at Mega Fund, Scrum Scaling, Scaling at Medicin soft. Rules: Sprint Planning Meeting, Daily Scrum Meeting, Sprint Review Meeting, Sprint Retrospective meeting.

Text Books:

1. Agile Project Management with Scrum, Ken Schwaber, Microsoft Press.
2. Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Hazza and Dubinsky, Springer.
3. Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, David J. Anderson and Eli Schragenheim, Prentice Hall.

Reference Books:

1. Agile Software Development - Evaluating the methods for your organizations, Alan S. Koch, Artech House
2. Agile Software Development, Cockburn, Highsmith, Alistair Cockburn Series.
3. Agile Estimating and Planning, Mike Cohn, Prentice Hall.
4. Agile Software Development Ecosystems - Jim Highsmith, Addison Wesley.
5. Essential Scrum - A Practical Guide to the Most Popular Agile Process, Kenneth S. Rubin, Addison Wesley.

Web Links:

1. <https://www.edx.org/course/agile-software-development>
2. <https://www.class-central.com/course/coursera-agile-software-development-9513>
3. <https://www.cprime.com/resources/what-is-agile-what-is-scrum/>
4. <https://www.atlassian.com/agile/kanban>
5. https://file.scirp.org/pdf/JCC_2017033115471602.pdf

NATURAL DISASTER MANAGEMENT & MITIGATION

(Open Elective-III)

VII Semester

Course Code: 201CE7O01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the aspects of disaster management and adopt remedial measures
- CO2: Explain disaster risk assessment and coping measures.
- CO3: Explain the vulnerability conditions
- CO4: Assess the impact of hazards on structures
- CO5: Adopt the rehabilitation procedures

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction Concept of Disaster Management. Types of Disasters. Disaster mitigating agencies and their organizational structure at different levels.

Unit – II

Overview of Disaster Situations in India Vulnerability of profile of India and Vulnerability mapping including disaster – prone areas, communities, places. Disaster preparedness – ways and means; skills and strategies; rescue, relief reconstruction. Case Studies: Lessons and Experiences from Various Important Disasters in India and Biological disasters – SARS- spread and transmisstions -pandemic, endemic and epidemic.

Unit – III

Flood and Drought Disaster Raising flood damage, assessing flood risk, flood hazard assessment, flood impact assessment, flood risk reduction options. Drought and development, relief management and prevention, drought mitigation and management- integrating technology and people.

Unit – IV

Landslide and Earthquake Disaster Land slide hazards zonation mapping and geo environmental problems associated with the occurrence of landslides. The use of electrical resistivity method in the study of landslide. Causes and effects of earthquakes. Secondary effects. Criteria for earthquake resistant design.

Unit – V

Cyclone and Fire Disaster Cyclone occurrence and hazards. Cyclone resistant house for coastal areas. Disaster resistant construction role of insurance sector. Types of fire. Fire safety and firefighting method, fire detectors, fire extinguishers. Rehabilitation: Rehabilitation programmes, Management of Relief Camp.

Text Books:

1. Disaster Management, RB Singh (Ed), Rawat Publications, 2000.
2. Disaster Management Future Challenges and Opportunities, Jagbir Singh, I.K International publishing house

Reference Books:

1. Natural Hazards in the Urban habitat by Iyengar, CBRI, Tata McGraw Hill
2. Natural Disaster management, Jon Ingleton (Ed), Tulor Rose, 1999
3. Anthropology of Disaster management, Sachindra Narayan, Gyan Publishing house, 2000

Web Links:

1. <https://www.youtube.com/watch?v=2v7N5a3tLgE>
2. <https://www.youtube.com/watch?v=5KtVocJfVGw>
3. https://www.iare.ac.in/sites/default/files/lecture_notes/dm%20notes.pdf

BASICS OF SOIL MECHANICS
(Open Elective-III)

VII Semester
Course Code: 201CE7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain physical properties of soil and its determination
- CO2: Determine the various index properties and the classification of soil
- CO3: Assess the stress developed due to various loads and soil conditions
- CO4: Explain the various compaction methods and the determination of permeability
- CO5: Explain the concept of consolidation, compressibility and settlement calculation

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Physical Properties of Soil:

Three phase system - phase diagram - physical properties Functional Relationships between physical properties-determination of water content, specific gravity, In-situ density-Relative density

Unit – II

Plasticity Characteristics of soil: Consistency, Atterberg's limits and their determination liquid limit, plastic limit, shrinkage limit - Index properties-Activity-Free swell index. Soil Classification: Soil classification-need and criteria for soil classification-IS Particle size classification-Classification tests-grain size analysis - hydrometer analysis- grain size distribution curve - Unified Soil Classification- Indian Standard Soil classification- Coarse grained soils- Fine grained soils-Plasticity chart.

Unit – III

Effective stress: Stresses due to self-weight-total, neutral and effective stresses – Pressure diagrams under different soil conditions. Stresses due to applied loads: Boussinesq theory- Concentrated load-Strip footing-circular footing- Rectangular footing-Newmark's influence chart - Pressure bulb-Significant depth Westergaard's theory - 2:1 distribution method

Unit – IV

Compaction: Principle of compaction, OMC and MDD, Lab tests-IS light weight and heavy weight compaction tests, Factors affecting compaction - zero air void line-Effect of compaction on engineering properties of soils - Field compaction control – Proctor's Needle.

Permeability and Seepage: types of soil water, Permeability-Darcy's law-Factors effecting permeability-laboratory tests-Average permeability of stratified soils. Seepage pressure critical hydraulic gradient -quick sand condition.

Unit – V

Consolidation: Definition and significance-mechanism-Terzaghi's soil-spring analogy -lab consolidation test – e-log p curve-Coefficient of compressibility-coefficient of volume change-compression index-determination of consolidation settlement – Terzaghi's theory of 1D consolidation- Time-settlement calculations. Determination of coefficient of consolidation-time fitting methods – Pre-consolidation pressure-normally consolidated and over consolidated clays- secondary consolidation.

Text Books:

1. Arora, K.R. (2019), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi
2. Gopal Ranjan and Rao, A.S.R., "Basic and Applied Soil Mechanics", New Age Ltd. International Publisher New Delhi (India) 2016
3. B.M Das, "Principles of Geotechnical Engineering", 8 th edition 2014, Cengage Publications.
4. Murthy, V.N.S. (2018), "A textbook of Soil Mechanics and Foundation Engineering", UBS Publishers Distributors Ltd., New Delhi.

Reference Books:

1. Craig, R.F. (2019), "Soil Mechanics", McGraw hill, New Delhi
2. Narasinga Rao, B.N.D. (2015), Soil Mechanics and Foundation Engineering, Wiley Publishers

Web Links:

1. <http://nptel.ac.in/courses/105103097/>

CONSTRUCTION MATERIALS AND EQUIPMENTS

(Open Elective-III)

VII Semester
Course Code: 201CE7O03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the tests on stones, cement and aggregates.
- CO2: Explain the concepts of strength and durability testing on mortar and concrete.
- CO3: Compare the properties of most common and advanced building materials.
- CO4: Selection of Automation techniques in construction industry.
- CO5: Analyze benefits of robotics versus conventional construction equipment.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Stones, Bricks and Concrete Blocks: Stone as building material–Criteria for selection– Tests on stones– Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks–Compressive Strength–Water Absorption–Efflorescence–Bricks for special use–Refractory bricks–Cement, Concrete blocks– Light weight concrete blocks. Nano Aggregate – RCA (Recylced Concrete Aggregate) – RCCA.

Unit – II

Lime, Cement, Aggregate and Mortar: Lime–Preparation of lime mortar–Cement– Ingredients– Manufacturing process–Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength –Tensile strength–Fineness– Soundness and consistency–Setting time–Industrial byproducts–Fly ash – Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index–Elongation Index –Abrasion Resistance –Grading–Sand Bulking.
 Concrete: Ingredients–ManufacturingProcess–Batchingplants–RMC–Propertiesoffresh concrete – Slump – Flow and compaction Factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture – Tests – Mix specification
 – Mix proportioning – BIS method – High Strength Concrete and HPC – Self compacting Concrete –Other types of Concrete–Durability of Concrete.

Unit – III

Modern materials: Glass–Ceramics–Sealants for joints–Fibre glass reinforced plastic–Clayproducts–Refractories–Compositematerials–Types–Applicationsoflaminarcomposites– Fibre textiles– Geo membrane sand Geotextiles for earth reinforcement.

Unit – IV

Introduction: Unique features of construction equipment, Need of construction Equipment, past history. Construction equipment: Capacity, Feasibility, owning and operating cost and Productivity of Different Equipment: Excavators, Pavers, Plastering machines; Pre-stressing jacks and grouting equipment; Cranes and Hoists, Concrete Batching Plants, etc.

Unit – V

Automation in Construction Industry: Need and Benefit of automation: Automation in Canal lining, Automation in Construction of Highway, Automation in concrete technology. Robotics in Construction: Use of robots for construction activities like Brick laying, Demolition, Material Handling, Structural steel cutting, Rebar tying/bending, Form work mould making, 3D printing- print complex, layered, parts and objects of homes, buildings, bridges and roads.

Text Books:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt. Ltd, New Delhi, 2018.
2. Rajput.R.K., "Engineering Materials", S.ChandandCompanyLtd.,2018.
3. Shetty.M.S., "Concrete Technology (Theory and Practice)", S. Chand and Company Ltd.,2019
4. Construction Planning, Methods and Equipment, R.L Peurifoy, McGraw Hill, 2015.

Reference Books:

1. Jagadish.K.S, "AlternativeBuildingMaterialsTechnology", NewAgeInternational,2017.
2. Gambhir.M.L.,&NehaJamwal, "BuildingMaterials,products,propertiesandsystems", TataMcGrawHillEducationsPvt.Ltd,NewDelhi,2019.
3. Robotics and Automation in Construction, Open access peer- reviewed edited volume-2017.
4. Automation in Construction Management: Automated management of Construction Materials Using RFID Technology, Javad Majrouhi Sardroud, Scholars' Press, 2015.

Web Links:

1. <https://nptel.ac.in/courses/105/102/105102012/>
2. <https://nptel.ac.in/courses/105/106/105106176/>
3. <https://nptel.ac.in/courses/105/104/105104030/>
4. <https://www.digimat.in/nptel/courses/video/105106176/L01.html>

SPECIAL ELECTRICAL MACHINES
(Open Elective-III)

VII Semester
Course Code: 201EE7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Distinguish between brush dc motor and brushless dc motor.
- CO2: Explain the performance and control of stepper motors, and their applications.
- CO3: Describe the theory of operation and control of switched reluctance motor.
- CO4: Describe the principle of operation of square wave BLDC motor.
- CO5: Describe the principle of operation of sine wave BLDC motor.
- CO6: Demonstrate working of the Linear Induction motor drives.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	1	3	1	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	1	3	1	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	3	1	1	-	-	-	-					

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Permanent magnet materials and PMDC motors: Introduction-classification of permanent magnet materials used in electrical machines- minor hysteresis loop and recoil line-Stator frames of conventional dc machines- Development of electronically commutated dc motor from conventional dc motor- Permanent-magnet materials and characteristics-B-H loop and demagnetization characteristics-Temperature effects: reversible and irreversible losses-high temperature effects-reversible losses- Irreversible losses recoverable by magnetization-Mechanical properties, handling and magnetization-Application of permanent magnets in motors- power density-operating temperature range-severity of operation duty.

Unit - II

Stepper Motors: Classification of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybrid type synchronous stepper motor – Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of 2-phase hybrid stepping motor. Construction and principle of operation of Variable Reluctance Motor (VRM) – Single stack and multiple stack – Open loop control of 3- phase VR Stepper Motor- Applications.

Unit – III

Square Wave Permanent Magnet Brushless DC Motor:Types of constructions – Surface mounted and interior type permanent magnet – Principle of operation of BLDC motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency- Square wave brushless motors with 1200 and 1800 magnetic areas commutation.

Unit – IV

Square Wave Permanent Magnet Brushless DC Motor:Types of constructions – Surface mounted and interior type permanent magnet – Principle of operation of BLDC motor. Torque and EMF equations – Torque speed characteristics – Performance and efficiency- Square wave brushless motors with 1200 and 1800 magnetic areas commutation.

Unit – V

Sine wave Permanent Magnet Brushless Motor: Torque and EMF equations – Phasor Diagram – Circle diagram – Torque/speed characteristics – Comparison between square wave and sine wave permanent magnet motors - Applications Induction Motors (LIM):Construction– principle of operation–Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one sided LIM with back iron- equivalent circuit of LIM.

Text Books:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
2. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.

Reference Books:

1. Special electrical machines, E.G. Janardhanan, PHI learning private limited, 2014.
2. Generalized theory of Electrical Machines – P.S. Bhimbra, Khanna Publishers.
3. Electrical Technology - Volume II - AC and DC Machines, B.L Thareja - A.K. Theraja, S.Chand Publishers.

Web Links:

1. <https://www.scribd.com/doc/207769552/Special-Electrical-Machines-PPT>

ELECTRICAL AND HYBRID VEHICLES
(Open Elective-III)

VII Semester
Course Code: 201EE7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the characteristics of electrical and hybrid vehicles.
- CO2: Analyze the models to describe electric trains and their performance.
- CO3: Compare and evaluate the different possible ways of energy storage.
- CO4: Demonstrate the sizing of the drive system.
- CO5: Apply the different strategies related to energy management

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction: Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Unit - II

Electric Trains: Electric Drive-trains: Basic concept of electric traction, introduction to various electric drivetrain topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, configuration and control of DC Motor drives, configuration and control of Induction Motor drives, configuration and control of permanent magnet motor drives, configuration and control of switch reluctance motor drives, drive system efficiency.

Unit - III

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy

storage devices.

Unit – IV

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.

Unit – V

Energy Management Strategies: Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

Reference Books:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.
3. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.

Web Links:

1. <https://nptel.ac.in/courses/108/102/108102121/>
2. <https://nptel.ac.in/courses/108/103/108103009/>
3. <https://nptel.ac.in/courses/108/106/108106170/>

INSTRUMENTATION (Open Elective-III)

VII Semester
Course Code: 201EE7O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the various types of signals
- CO2: Explain the various types of Transducers.
- CO3: Calculate various parameters such as strain, velocity, temperature, pressure etc.
- CO4: Explain the working principle of various types of digital Voltmeters and measure various parameters like phase and frequency of a signal with the help of CRO.
- CO5: Explain the various types of signal analyzers

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Signals and their representation: Measuring Systems, Performance Characteristics, – Static characteristics – Dynamic characteristics – Errors in Measurement – Gross Errors – Systematic Errors – Statistical analysis of random errors – Signal and their representation – Standard test, periodic, aperiodic, modulated signal – Sampled data pulse modulation and pulse code modulation.

Unit – II

Transducers: Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, LVDT and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Gauge factor – Thermistors – Thermocouples – Synchros – Piezo electric transducers – Photo diodes.

Unit – III

Measurement of Non-Electrical Quantities: Measurement of strain – Gauge Sensitivity – Displacement – Velocity – Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

Unit – IV

Digital Voltmeters & Oscilloscope: Digital voltmeters – Successive approximation, ramp, dual-Slope integration continuous balance type – Microprocessor based ramp type – DVM - Cathode ray oscilloscope – Time base generator – Horizontal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns.

Unit – V

Signal Analyzers: Wave Analyzers – Frequency selective analyzers – Heterodyne – Application of Wave analyzers – Harmonic Analyzers – Total Harmonic distortion – Spectrum analyzers – Basic spectrum analyzers – Spectral displays – Vector impedance meter – Q meter – Peak reading and RMS voltmeters - digital frequency meter – Digital phase angle meter- Analog and digital type data logger.

Text Books:

1. Electronic Instrumentation–by H. S. Kalsi Tata McGraw–Hill Edition, 1995.
2. A course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, Dhanpatrai& Co.

Reference Books:

1. Measurement and Instrumentation theory and application, Alan S. Morris and Reza Langari, Elsevier
2. Measurements Systems, Applications and Design – by D O Doeblin.
3. Principles of Measurement and Instrumentation – by A.S Morris, Pearson/ Prentice Hall of India.
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W. D. Cooper, Pearson/Prentice Hall of India.
5. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

Web Links:

1. <https://nptel.ac.in/courses/108105064/>
2. <https://nptel.ac.in/courses/103103037/39>
3. <https://nptel.ac.in/courses/103105064/36>

OPTIMIZATION TECHNIQUES (Open Elective-III)

VII Semester
Course Code: 201ME7001

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Apply the constraints and solve single and multivariable optimization problems in Engineering
- CO2: Solve Unconstrained Optimization problems using Search methods and Descent methods
- CO3: Solve Constrained Optimization problems using Penalty Function methods
- CO4: Apply Genetic algorithm and Particle Swarm optimization Techniques in engineering applications
- CO5: Use Advance optimization techniques to formulate and solve for implementation

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction To Optimization: Engineering applications of optimization- statement of an optimization problem- classification of optimization problem- optimization techniques.

Classical Optimization Techniques: Single variable optimization- multivariable optimization with equality constraints- multivariable optimization with inequality constraints.

Unit – II

Unconstrained Optimization Techniques: Pattern search method- Simplex method- Descent methods- Gradient of function- Steepest Descent method.

Unit – III

Constrained Optimization Techniques: Characteristics of a constrained problem methods offeasible directions-basicapproachinthe penaltyfunctionmethod-interiorpenaltyfunction method- convex programming problem- exterior penalty functionmethod.

Unit – IV

Algorithms: Genetic Algorithm, Particle Swarm Optimization Algorithm, and its applications.

Unit – V

Advanced Techniques: Teaching – Learning Based Algorithm, Water Canal Algorithm (WCA), Social Group Optimization (SGO) and its implementation.

Text Books:

1. Optimization Theory and Applications/ S.S. Rao/Wiley Eastern Limited,New Delhi
2. Cordan C.C. Beveridge and Robert S. Schedther, "Optimization, Theory and Practice" McGraw HillCo.1970.
3. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition,2009.
4. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd.,2004

Reference Books:

1. Engineering Optimization / Kalyanmanai Deb/Prentice Hall of India,New Delhi.
2. Optimization Techniques-Theory and applications/C.Mohan & Kusum Deep/New Age International
3. Operations Research /S.D. Sharma / MacMillan Publishers
4. Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi,2005

Web Links:

1. <https://nptel.ac.in/courses/112/101/112101298/>
2. <https://nptel.ac.in/courses/111/105/111105100/>
3. <https://nptel.ac.in/courses/112/105/112105235/>
4. <https://nptel.ac.in/courses/112/103/112103301/>

ENERGY CONSERVATION

(Open Elective-III)

VII Semester
Course Code: 201ME7002

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the concepts of National Energy consumption, Energy Auditing, and its types
- CO2: Describe the improvement in efficiency of various electrical equipment's like capacitors and electric motors etc.
- CO3: Discuss the concept of illumination and types of lighting.
- CO4: Describe the improvement in efficiency of various mechanical equipment's like boilers, condensers, and steam lines etc
- CO5: Discuss the energy efficiency of components like pumps, blowers, fans, and various refrigeration equipment's
- CO6: Apply the concepts of energy economics like payback period, internal rate of returns life cycle costing etc..

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	1	-	-	-	-	1
CO2	3	1	-	-	-	-	1	-	-	-	-	1
CO3	3	1	-	-	-	-	1	-	-	-	-	1
CO4	3	1	-	-	-	-	1	-	-	-	-	1
CO5	3	1	-	-	-	-	1	-	-	-	-	1
CO6	3	1	-	-	-	-	1	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Energy - Power – Past & Present scenario of World; National Energy consumption , Data Environmental aspects associated with energy utilization –Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing

Unit – II

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors – Motor, Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting, and scope of Encon in Illumination.

Unit – III

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

Unit – IV

Energy efficiency in Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

Unit – V

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concepts

Text Books:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, Industrial Energy Management and Utilisation, Hemisphere Publ, Washington, 1988.
2. Callagh, P.W. Design and Management for Energy Conservation, Pergamon Press, Oxford,1981.

Reference Books:

1. Dryden. I.G.C., The Efficient Use of Energy Butterworths, London, 1982
2. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com, a website of Bureau of Energy Efficiency (BEE), A statutory body under Ministry of Power, Government of India, 2004.
3. Murphy. W.R. and G. Mc KAY, Energy Management”, Butterworths, London 1987.
4. Turner. W.C., Energy Management Handbook, Wiley, New York, 1982

Web Links:

1. <https://nptel.ac.in/courses/112105221>
2. <https://nptel.ac.in/courses/108106022>

INTRODUCTION TO MATERIAL HANDLING SYSTEM
(Open Elective-III)

VII Semester
Course Code: 201ME7003

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the classification of the Material Handling Equipment
- CO2: Explain processing stations and material handling systems used in FMS environments
- CO3: Discuss how to connect loading stations to the different discharge conditions
- CO4: Design the parameters of conveyors and elevators
- CO5: Design the parameters of Cranes and Hoists based on industrial requirements
- CO6: Explain the usage and handling of Special material handling equipment

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	1
CO2	3	-	-	-	-	-	-	-	-	-	-	1
CO3	2	2	-	-	3	-	-	-	-	-	-	1
CO4	2	3	-	-	-	-	-	-	-	-	-	1
CO5	2	3	-	-	-	-	-	-	-	-	-	1
CO6	2	2	1	-	3	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Principal groups of material handling equipment, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipment, general characteristics of surface and overhead equipment and their applications

Unit – II

Unit Material handling and Storage:

Unit load concept, Industrial Hand trucks, Powered industrial trucks, Automated Guided Vehicles(AGV), Basic storage and equipment system, Automated Storage and Retrieval System(AS/RS), Carosel storage system and its applications

Unit – III

Conveyors:

Types - description - design of Belt conveyors, roller conveyors, overhead conveyors, apron conveyor, Bucket Conveyor,-Pneumatic and Hydraulic Conveyors- component parts and operational details and applications with physical layouts

ELEVATORS:

Bucket elevators: design - loading and bucket arrangements - Cage elevators - shaft way, guides,

counter weights, hoisting machine, safety devices - Design of fork lift trucks.

Unit – IV

Cranes, Hoists and Monorails:

Jib Cranes, number of mechanism in Jib cranes, Jib construction, Bridge Crane, Harbour Cranes, Shipyard Gantry Cranes Design of Hoists: Design of hoisting Equipment likes: Wire and Hemp Rope, Welded and roller chains. Design of ropes, pulleys, Pulley systems, Sprockets and drums, Load handling attachments. Design of Hooks: forged hooks and eye hooks, Girder Design, Crane grabs, Grabbing attachments, Design of arresting gear

Unit – V

Special material Handling equipment, Wagon tipplers, Stackers, Reclaimers- Constructional details, Pneumatic Conveyors, typical material handling layouts and applications

Robotic handling : Materials handling at workplace; Major components of a robot; Applications of robotic handling

Text Books:

1. Introduction to Materials Handling.Siddhartha Ray ,New Age International Pvt Ltd; 2nd edition, 2017
2. Material Handling, Immer J. R., Tata McGraw Hill Publication, 1953

Reference Books:

1. Flexible Manufacturing System , Dr. H K Shivanand,— DhanpatRai Publication, New Delhi
2. Automation Production System and Computer Integrated Manufacturing,Mikell P. Groover, Pearson Education India, 4th edition 2016
3. Material Handling Principles and Practice , Theodore H., Allegre Sr., , CBS Publishers and Distributors
4. Aspects of material handling / Dr.KC Arora &Shinde ,lakshmi publications
5. Material Handling System Design , James M Apple,

Web Links:

1. <https://nptel.ac.in/courses/113105104>
2. <http://www.digimat.in/nptel/courses/video/112103293/L27.html>
3. <https://www2.isye.gatech.edu/>

ROBOTICS
(Open Elective-III)

VII Semester
Course Code: 201ME7004

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the basic concepts, parts of robots and types of robots.
- CO2: Identify various robot configuration and components,
- CO3: Select appropriate actuators and sensors for a robot based on specific application
- CO4: Explain the forward and inverse kinematics of robots.
- CO5: Explain the dynamic analysis of robots.
- CO6: Analyze the trajectory planning for a manipulator by avoiding Obstacles

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	1	-	3	-	-	-	-	-	-	-
CO2	2	1	1	-	3	-	-	-	-	-	-	-
CO3	2	2	1	-	3	-	-	-	-	-	-	-
CO4	2	2	1	-	3	-	-	-	-	-	-	-
CO5	2	2	1	-	3	-	-	-	-	-	-	-
CO6	2	2	1	-	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

Unit - I

Automation-CAD/CAM-Robotics – An over view of Robotics – present and future applications, classification by coordinate system and control system. Applications of Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Unit – II

Components of the Industrial Robotics:Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, Grippers.

Robot Actuators and Feed Back Components:

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors-proximity sensors

Unit – III

Mapping and Transforms:Homogeneous transformations as applicable to rotation and translation –problems.
Manipulator Kinematics:Specifications of matrices, D-H notation joint coordinates and world coordinates
Forward and inverse kinematics – problems.

Unit – IV

Differential Motion and Dynamics:Differential transformation and manipulators, Jacobians – problems
Dynamics: Lagrange – Euler – Problems.

Unit – V

Trajectory Planning:General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

Text Books:

1. Industrial Robotics, Groover M P, Pearson Edu., 2nd Edition, 2017
2. Introduction to Robotics-Analys, Control, Applications - Saeed Niku, Wiley Publications, 2nd Edition, 2011,

Reference Books:

1. Robotics and Control, Mittal R K & Nagrath I J, Tata McGraw Hill, 2017
2. Introduction to Robotics, John J Craig, Pearson Edu., 3rd Edition, 2005
3. Robotic Engineering, Richard D. Klafter, Prentice Hall, 1989
4. Robotics, controls, sensing, vision and intelligent by Fu K S, Gonzales or Lea, Tata McGraw Hill, Indian Edition, 1987
5. Introduction To Robotics by S K Saha (IITD), Tata McGraw Hill, 2008

Web Links:

1. <https://nptel.ac.in/courses/107/106/107106090/>
2. <https://nptel.ac.in/courses/112/104/112104298/>
3. <https://nptel.ac.in/courses/112/105/112105249/>
4. <http://robotics.itee.uq.edu.au/~metr4202/2013/lectures.pdf>

DISCRETE TIME SIGNAL PROCESSING (Open Elective-III)

VII Semester
Course Code: 201EC7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Summarize Discrete Time Signals and Systems.
- CO2** Illustrate the functionality of fourier series and fourier transform
- CO3** Apply DFT properties to evaluate the given sequence.
- CO4** Make use of FFT Algorithms for DFT computation.
- CO5** Interpret the basic structures of FIR and IIR digital filters.
- CO6** Extend the single rate digital signal processing to multirate digital signal processing

Mapping of Course Outcomes with Program Outcomes:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO / PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to Digital Signal Processing:

Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

Unit – II

Discrete Fourier Series & Fourier Transforms:

Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT.

Unit – III

Fast Fourier Transforms:

Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

Unit – IV**Realization Of Digital Filters:**

Review of Z-transforms, Applications of Z-transforms, solution of difference equations - digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function.

Unit – V**Multirate Digital Signal Processing:**

Decimation, Interpolation, Sampling rate conversion, Implementation of sampling rate conversion.

Text Books:

1. Digital Signal Processing, Principles, Algorithms and Applications:John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.
2. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schaffer, PHI, 2010

Reference Books:

1. Fundamentals of Digital Signal Processing using MATLAB, Robert J. Schilling, Sandra L. Harris, Thomson, 2007.
2. Digital Signal Processing, P. Ramesh Babu, SciTech Publications, 6th Edition, 2014.
3. Digital Signal Processing, Tarun Kumar Rawat, Oxford University Press, 1st Edition, 2015.
4. Multirate Systems and Filter Banks, P. P. Vaidyanathan, Pearson, 1st Edition.

Web Links:

1. https://www.tutorialspoint.com/digital_signal_processing/index.htm
2. <https://nptel.ac.in/courses/117/102/117102060/> (Digital Signal Processing - Video course, Coordinator BY Prof. S.C. Dutta Roy Department of Electrical Engineering IIT Delhi)

LINEAR AND DIGITAL IC APPLICATIONS
(Open Elective-III)

VII Semester
Course Code: 201EC7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Construct Op Amps using the differential amplifier and other improvement circuits.
- CO2** Explain parameters related to measurement of Op-Amp characteristics.
- CO3** Construct the circuits for different linear applications using Op-Amp.
- CO4** Develop circuits for non-linear applications using Op-Amp.
- CO5** Construct the circuits for different Data conversion and Filtering applications using Op-Amp.
- CO6** Compare different digital logic families.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	1	3	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	1
CO3	2	2	3	-	-	-	-	-	-	-	-	2
CO4	2	2	3	-	-	-	-	-	-	-	-	2
CO5	2	2	3	-	-	-	-	-	-	-	-	2
CO6	3	2	2	-	-	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to Integrated Circuits: Integrated Circuits Types, Classification, Package Types, Temperature ranges and Power supplies. Differential Amplifier-DC And AC analysis of differential amplifier configurations, circuits for improving CMRR, Necessity of swamping resistors, Cascaded Differential Amplifier Stages and Level translator.

Unit – II

Characteristics of Op-Amps: Block Diagram of a Op-Amp, Pin diagram, symbolic representation and features of 741IC, Ideal and practical characteristics of an Op-Amp, Equivalent circuit of an Op-Amp, Define the terms input offset voltage and current, input bias current, CMRR, Slew Rate, PSRR, etc, Virtual ground concept, DC characteristics, AC characteristics and Measurement of Op-Amp parameters.

Unit – III

Linear and Non-Linear Applications of Op- Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non-Linear Applications-Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti-log Amplifiers, Precision rectifiers.

Unit – IV

D-A and A-D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs parallel Comparator type ADC,counter type ADC,Successive Approximation ADC and dual slope ADC.DAC and ADC Specifications.

Active Filters: Introduction, Butter worth filters – 1st order, 2nd order LPF, HPF filters.Band pass, Band reject and All pass filters.

Unit – V

Digital Logic Families and Interfacing:Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families,CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

Text Books:

1. Op Amps and Linear Integrated Circuits,Ramakant A.Gayakwad,4th Edition,PHI,Pearson Education, 2003.
2. Linear Integrated Circuits–D.RoyChowdhury,New Age International(p)Ltd, 2nd Edition,2003.
3. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 4th Ed.,

Reference Books:

1. Design with Operational Amplifiers & Analog Integrated Circuits-Sergio Franco,McGrawHill,1988
2. OPAMPS and Linear Integrated Circuits concepts and Applications, James MFiore,Cengage Learning India Ltd.
3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll,PHI,6thEdition.
4. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, Zvonko Vranesic, McGrawHill, 3rdEdition.

Web Links:

1. <http://nptel.ac.in/courses/117108038/Prof.GunashekaranM.K/IIScBangalore>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-01sc-introduction-to-electrical-engineering-and-computer-science-i-spring-2011/unit-3-circuits/op-amps>

PRINCIPLES OF EMBEDDED SYSTEMS
(Open Elective-III)

VII Semester
Course Code: 201EC7O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Summarize the building blocks of an embedded system.
- CO2** Interpret the hardware modules required to design an embedded system.
- CO3** Infer the firmware design approaches for an embedded system.
- CO4** Illustrate the hardware integration with firmware.
- CO5** Outline the process of embedded system development.
- CO6** Choose the tools for embedded system implementation and testing.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	2	3	1	-	-	-	-	-	-	-	-	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction: Embedded system-Definition, History of Embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

Unit – II

Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, multi processors architectures.

Unit – III

Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, Interrupt sources, ISR concept, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C.

Unit – IV

Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.

Hardware Software Co-Design:

Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

Unit – V

Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Deassembler/ Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Embedded System Implementation and Testing: The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine.

Text Books:

1. Embedded Systems, Shibu.K. V, Tata McGraw Hill Education Private Limited, 2013.
2. Embedded Systems-Architectures, Programming and Design, Raj Kamal, Tata McGraw Hill Publications.

Reference Books:

1. Embedded System Design, Frank Vahid and Tony Givargis, John Wiley Publications, 2013.
2. Hardware Software Co-Design Principles and Practice, J. Staunstrup, Springer Publications
3. Embedded Systems Architecture, Tammy Noergaard, Elsevier Publications, 2013.

Web Links:

1. <https://www.iitk.ac.in/tkip/workshop/sensors-and-actuators/ppt/sandeep.pdf>
2. http://www.artistembedded.org/docs/Events/2006/ChinaSchool/1_ESIntroduction.pdf
3. <http://web.cecs.pdx.edu/~mperkows/temp/hardware-software-codesign.pdf>
4. <http://www.inf.ed.ac.uk/teaching/courses/es/PDFs/RTOS.pdf>
5. <http://www.vtt.fi/inf/pdf/publications/2004/P526.pdf>

AI TOOLS & TECHNIQUES (Open Elective-III)

VII Semester
Course Code: 201CS7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Describe the fundamentals of Artificial Intelligence and its applications.
- CO2: Analyze the time and space complexities of searching techniques.
- CO3: Apply various logical systems to inference the different logical problems.
- CO4: Identify machine learning techniques suitable for a given problem
- CO5: Design multilayer model using back propagation techniques.
- CO6: Illustrate applications of AI Tools & techniques.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	2	2	-	-	-	-	-	-	-
CO2	2	2	-	3	2	-	-	-	-	-	-	-
CO3	2	3	-	2	2	-	-	-	-	-	-	-
CO4	2	2	-	3	2	-	-	-	-	-	-	-
CO5	2	1	-	2	3	-	-	-	-	-	-	-
CO6	1	3	-	2	2	-	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to AI- Definition, Problem, State space representation. Intelligent Systems: Categorization of Intelligent System, Components of AI Program, Foundations of AI, Applications of AI, Current trends in AI, Intelligent Agents: Anatomy, structure, Types.

Unit – II

Problem solving-Solving problem by Searching: Problem Solving Agent, Formulating Problems. Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods- Greedy best first Search, A* Search, Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems- Hill climbing search Simulated annealing and local beam search.

Unit – III

Knowledge and Reasoning-Knowledge based Agents, The Wumpus World, and Propositional logic. First Order Logic- Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining, Knowledge Engineering in First-Order Logic, Unification and Resolution.

Unit – IV

Concepts of Machine learning -Supervised, unsupervised, semi-supervised, Rote learning, Reinforcement learning, Issues, steps and applications, Designing a learning System. Case study- hand written digit recognition, stock price prediction. Learning Models- Decision tree learning. Probabilistic Models, Deterministic Models, Hidden Markov Model, Reinforcement Learning-Model based learning, Temporal Difference Learning, Generalization, Partially Observable States.

Unit – V

Artificial Neural Network: Introduction, neural network representation, Problems for neural network learning, perception, multilayer network & Back propagation Algorithm. Deep learning- Definition, relationship between AI, ML, and Deep Learning, Trends in Deep Learning.

Text Books:

1. Artificial Intelligence and Machine Learning, 1st Edition, Vinod Chandra S.S., Anand Hareendran S, 2014
2. Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education, Stuart J. Russell, Peter Norvig, 2002

Reference Books:

1. PROLOG Programming for Artificial Intelligence", 3rd Edition, Pearson Education, Ivan Bratko, 2002
2. Artificial Intelligence, Third Edition, McGraw Hill Education, Elaine Rich and Kevin Knight, 2017
3. Data Mining Concepts and Techniques, Morgan Kaufmann Publishers, Han Kamber, 2011
4. Machine learning with R, 2nd Edition, Brett Lantz, 2015
5. Genetic Algorithms: Search, Optimization and Machine Learning, 1st ed, Davis E. Goldberg, Addison Wesley, N.Y., 1989

Web Links:

1. <https://nptel.ac.in/courses/106/105/106105079/>
2. https://www.tutorialspoint.com/artificial_intelligence/
3. https://onlinecourses.nptel.ac.in/noc17_cs30/
4. <https://www.slideshare.net/girishnaik/artificial-intelligence-3638681/>
5. <https://www.mindmeister.com/44054594/expert-systems/>

CYBER SECURITY
(Open Elective-III)

VII Semester
Course Code: 201CS7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the cyber security and security management methods to maintain security protection
- CO2: Illustrate the nature of secure software development and operating systems.
- CO3: Summarize the Network management and cloud computing security issues.
- CO4: Analyze the data privacy techniques and data management.
- CO5: Demonstrate the role of security management in cyber security defense.
- CO6: Illustrate the legal and social issues related to cyber security.

Mapping of Course Outcomes with Program Outcomes:

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	2	-	-	2	-	-	-	-
CO2	2	3	-	2	2	-	-	-	-	-	-	-
CO3	1	2	-	2	3	-	-	-	-	-	-	-
CO4	1	2	-	3	2	-	-	-	-	-	-	-
CO5	2	1	-	-	2	-	-	3	-	-	-	-
CO6	2	1	-	2	-	-	-	3	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO / PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography. Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

Unit – II

Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks. Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

Unit – III

Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management . Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

Unit – IV

Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed. Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

Unit – V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

Text Books:

1. Pfleeger, C.P., Security in Computing, Prentice Hall, 5th edition.
2. Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons.

Reference Books:

1. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGrawHill.
2. Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology.
3. Information Security, Mark Rhodes, Ousley, 2 nd edition, MGH.

Web Links:

1. <https://www.edx.org/micromasters/ritx-cybersecurity>.
2. <https://www.coursera.org/specializations/cyber-security>.
3. <https://www.nptel.ac.in/courses/106105031/>.
4. <http://bedford-computing.co.uk/learning/wp-content/uploads/2016/08/>
5. <https://www.wileyindia.com/cyber-security-understanding-cybercrimescomputer-forensics-and-legal-perspectives.html>

BLOCK CHAIN TECHNOLOGIES (Open Elective-II)

VI Semester
Course Code: 201IT7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Demonstrate the blockchain and crypto currency basics
- CO2: Compare and contrast permissioned and permissionless blockchains
- CO3: Explain different types of crypto currency wallets
- CO4: Explain how to compile and deploy smart contracts using Etherium
- CO5: Summarize Hyperledger fabric architecture and different use cases
- CO6: Illustrate use cases of block chain technologies.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	2
CO2	2	3	1	-	-	-	-	-	-	-	-	2
CO3	2	3	1	-	-	-	-	-	-	-	-	2
CO4	2	2	3	-	-	-	-	-	-	-	-	2
CO5	2	2	3	-	-	-	-	-	-	-	-	2
CO6	3	2	-	-	2	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	3
CO5	-	3
CO6	-	2

Unit - I

Introduction: Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

Unit – II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction

Unit – III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

Unit – IV

EthereumBlockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ethers can, Ethereum Clients, Decentralized Application, Meta mask.

Unit – V

HyperledgerBlockchain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.

Text Books:

1. Agbadas, ArshadSarfrazAriff, Sham “Blockchain for Enterprise Application Developers”, Wiley
2. Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain”, O'Reilly

Reference Books:

1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, McGraw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Web Links:

1. <https://github.com/blockchainedindia/resources>
2. <https://github.com/HyperledgerHandsOn/trade-finance-logistics>
3. <https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger>
4. <https://www.university.mongodb.com/>

RISK MANAGEMENT IN PETROLEUM INDUSTRY

(Open Elective-III)

VII Semester
Course Code: 201PT7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identify the risk, assess the risk, plan of action, monitor and manage them.
- CO2: Explain the importance of risk management
- CO3: Explain the vulnerability, risk evaluation and risk assessment
- CO4: Apply the risk rating to different types of risk
- CO5: Explain the methods for performing safety

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to risk management: fundamentals of risk management; challenges- overview of cases; summary and conclusions
 Introduction of reliability: background; oil and gas industry safety and reliability-related facts, figures, and examples terms and definitions; useful sources for obtaining information on safety and reliability in the oil and gas industry.

Unit – II

Risk management principles and methods – review and discussion: perspectives on risk; economic principles, theories and methods; the cautionary and precautionary principles; the meaning and use of expected values in risk management; uncertainty handling (in different project phases); risk acceptance and decision-making; on the ethical justification for the use of risk acceptance criteria

Unit – III

A risk management framework for decision support under uncertainty: introduction; basic building blocks of the framework; the framework; discussion and conclusions.

Applications – operations phase: decision-making context; deficiencies and the need for an alternative process; framing of decision problem and decision process; generation and assessment of alternatives; managerial review and decision; discussion; observations

Unit – IV

Safety and reliability basics: introduction; need for safety and safety and engineers; safety management principles; product hazard classifications and product safety organization tasks; common causes of work injuries and mechanical injuries; accident causation theories; occupational stressors and human error occurrence reasons; consequences of human error and human error classifications; bathtub hazard rate curve general reliability-related formulas; reliability networks

Unit – V

Methods for performing safety and reliability analyses in the oil and gas industry: introduction; root cause analysis; hazards and operability analysis; technique of operations review; interface safety analysis; job safety analysis; preliminary hazard analysis; failure modes and effect analysis; fault tree analysis; Markov method.

Text Books:

1. Safety and Reliability in Oil and Gas Industry: A Practical Approach, B. S. Dhillon; CRC press; 1st Edition; 2016.
2. Risk Management with applications from the Offshore Petroleum Industry; T. Aven and J.E. Vinnem; Springer Publication; 1st Edition; 2007.

Reference Books:

1. Reliability and Risk Assessment: Offshore Structural Engineering; Srinivansan. Chandrasekharan; CRC Press; 1st Edition; 2016.
2. Health, Safety and Environmental Management in offshore And Petroleum Engineering; Srinivansan Chandrasekharan; Wiley Publication; 1st Edition; 2016.

Web Links:

1. <http://extensionrme.org/pubs/introductiontoriskmanagement.pdf>
2. [https://csrc.nist.gov/projects/risk-management/risk-management-framework-\(rmf\)-overview](https://csrc.nist.gov/projects/risk-management/risk-management-framework-(rmf)-overview)
3. https://www.springer.com/cda/content/document/cda_downloaddocument/9781846286520-c1.pdf?SGWID=0-0-45-357418-p173696908
4. <https://www.capterra.com/risk-management-software/>
5. <https://www.ehstoday.com/safety/safety-practices-oil-and-gas-industry-infographic>

CARBON SEQUESTRATION
(Open Elective-III)

VII Semester
Course Code: 201PT7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain technology concepts of CO₂ capture, sequestration and utilization
- CO2: Develop more sustainable technologies for energy supply
- CO3: Explain the concept of low energy transition and carbon management.
- CO4: Identify new technologies for low carbon energy supply with CO₂ capture and storage , summarize the different principles of CO₂ capture
- CO5: Explain the basic concepts of carbon capture, utilization and storage , its role in reducing emissions

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction of CO₂ Capture, Sequestration and Utilization

Scope, objectives and necessity of CO₂ Capture, Sequestration and Utilization. The contribution of fossil fuels emission to climate change and global warming. Concept of carbon credit and carbon footprint.

Unit – II

Basis for CO₂ Capture:

CO₂ capture systems: Industrial process captures system-Post-combustion, Pre-combustion, Oxy-fuel

Unit – III

Separation processes with absorbent and membranes. Photo synthesis, Carbon capture process.

Unit – IV

Carbon Capture Techniques

CO₂ emission, scrubbing of CO₂, CO₂ re-cycling. CO₂ sequestration: underground storage, potential for geologic storage, and applications in oil and gas industry. Direct air capture and storage

Unit – V

CO₂ Geological Storage Technologies

Storage mechanisms and security, CO₂ Storage Resources Management Systems, Geological characterization, Performance prediction, Integrity, Measurement, Monitoring and Verification, CO₂ flooding projects and methane recovery projects Carbon farming, Biochar

Text Books:

1. Berend Smit, Introduction to Carbon Capture and Sequestration, Imperial college press, 2014
2. Stephen A. Rackley, Carbon Capture and Storage, Elsevier, 2017

Reference Books:

1. Goel, Malti, M. Sudhakar, and Ram Vinay Shahi, eds. Carbon capture, storage and utilization: a possible climate change solution for energy industry. CRC Press, 2019
2. Goel, Malti, and M. Sudhakar, eds. Carbon utilization: applications for the energy industry. Springer, 2017

Web Links:

1. <https://www.rff.org/publications/explainers/carbon-capture-and-storage-101/>
2. https://19january2017snapshot.epa.gov/climatechange/carbon-dioxide-capture-and-sequestration-overview_.html
3. https://19january2017snapshot.epa.gov/ghgreporting/subpart-pp-suppliers-carbon-dioxide_.html
4. <https://www.frontiersin.org/articles/10.3389/fenrg.2014.00055/full>

COMMUNICATION SYSTEM IN MINES
(Open Elective-III)

VII Semester
Course Code: 201MI7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Demonstrate types of signals and relation of time domain representation to frequency domain.
- CO2: Apply signal concepts to continuous wave modulation.
- CO3: Interpret the basic concepts of pulse modulation.
- CO4: Analyze the concepts of digital modulation techniques.
- CO5: Summarize different advanced communication networks.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction

Importance of mine communication, Basic terminologies- signal, amplitude, wavelength, Frequency, Bandwidth, Modulation Demodulation, Attenuation, Transducer, Amplification, Repeater. Classification of Communication Systems in Mines

Unit – II

Wired Communication Systems

Magneto phones, Voice powered phones, Paging phones, Dial & Page phones, layout of communication system in underground mines.

Unit – III

Radio Communication Systems

Through-the Earth (TTE) systems, In Mine systems, Wireless Network (WN) systems, Ultra-Wide Band (UWB) systems.

Unit – IV

Carrier Current and Hybrid Systems

Trolley carrier's phones, Hoist rope phones, Leaky feeder system, Fiber backbone network, Radio Frequency Identification (RFID) system

Unit – V

Modern Communication Systems

Seismic systems, Stench systems, Visual Pager systems, Optical Systems, Zigbee systems, IoT based communication system.

Text Books:

1. Wireless Communication in Underground Mines: RFID-based Sensor by L.K. Bandyopadhyay, S.K. Chaulya, P.K. Mishra, Networking 2010th Edition, Kindle Edition, Springer
2. Mining Over Air: Wireless Communication Networks Analytics, Y. Ouyang, M. Hu.

Reference Books:

1. Smart Communication in Coal Mines, Sanjay Kumar Surshetty, Jaya Anand, Sneha Chowdhury, Vijay Nath, Springer Singapore.

Web Links:

1. <https://sci-hub.se/10.1109/SURV.2009.090309>
2. http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_107828.pdf
3. <https://www.cdc.gov/niosh/mining/content/commglossary.html>

WATER HARVESTING AND SOIL CONSERVATION STRUCTURES
(Open Elective-III)

VII Semester
Course Code: 201AG7O01

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Recommend the short term and long term runoff harvesting at appropriate places in watershed.
- CO2: Design criteria and cost estimation of farm ponds.
- CO3: Explain the functions of soil erosion control structures.
- CO4: Apply the concept hydraulic jump, runoff measuring structures and various permanent gully control structures.
- CO5: Estimate the load analysis on various components of soil conservation structures.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Water harvesting -principles, importance and uses. Water harvesting techniques – classification based on source, storage and use. Runoff harvesting – short-term and long-term techniques. Short-term harvesting techniques - contour bunds, semicircular hoop, trapezoidal bunds, graded bunds, rock catchment and ground catchment. Long term harvesting techniques- purpose and design criteria

Unit - II

Structures - farm ponds - dug-out and embankment reservoir types, tanks and subsurface dykes. Farm pond - components, site selection, design criteria, capacity, embankment, mechanical and emergency spillways, cost estimation and construction. Percolation pond - site selection, design and construction details. Design considerations of nala bunds.

Unit - III

Soil erosion control structures - introduction, classification and functional requirements. Design of Gabion structures. Permanent structures for soil conservation and gully control – check dams, drop, chute and drop inlet spillways - design requirements, planning for design, design procedures - hydrologic, hydraulic and structural design and stability analysis.

Unit – IV

Hydraulic jump and its application. Drop spillway - applicability, types - straight drop, box-type inlet spillways - description, functional use, advantages and disadvantages, straight apron and stilling basin outlet, structural components and functions.

Chute spillway - description, components, energy dissipaters, design criteria of Saint Antony Falls (SAF) stilling basin and its limitations. Drop inlet spillway - description, functional use and design criteria.

Unit – V

Loads on head wall, variables affecting equivalent fluid pressure, triangular load diagram for various flow conditions, creep line theory, uplift pressure estimation, safety against sliding, overturning, crushing and tension.

Text Books:

1. Michael, A.M. and T.P. Ojha. 2003. Principles of Agricultural Engineering. Volume II. 4th Edition, Jain Brothers, New Delhi.
2. Singh Gurmel, C. Venkataraman, G. Sastry and B.P. Joshi. 1996. Manual of Soil and Water Conservation Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Suresh, R. 2014. Soil and Water Conservation Engineering. Standard Publisher Distributors, New Delhi.

Reference Books:

1. Murthy, V.V.N. 2002. Land and Water Management Engineering. 4th Edition, Kalyani Publishers, New Delhi.
2. Schwab, G.O., D.D. Fangmeier, W.J. Elliot, R.K. Frevert. 1993. Soil and Water Conservation Engineering.4th Edition, John Wiley and Sons Inc. New York.

Web Links:

1. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125071>
2. <http://ecoursesonline.iasri.res.in/course/view.php?id=54>
3. <https://nptel.ac.in/courses/126/105/126105012/>
4. <https://www.fao.org/land-water/water/water-management/water-storage/en/>
5. <https://www.fao.org/3/W7314e/w7314e0q.html>.

API AND MICROSERVICES
(Job Oriented Course-III)

VII Semester
Course Code: 201CS7J01

L T P C
 3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Develop a Spring Data JPA application with Spring Boot
- CO2: Implement CRUD operations, pagination and sorting mechanism using Spring Data JPA
- CO3: Implement a custom repository to customize a querying mechanism using Spring Data JPA
- CO4: Implement Spring Transaction using Spring Data JPA
- CO5: Develop RESTful endpoints using Spring REST Processing URI parameters
- CO6: Write Spring based REST clients to consume RESTful services programmatically

Mapping of Course Outcomes with Program Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	3	-	1	-	-	-	-	-	-	-
CO2	3	2	2	-	1	-	-	-	-	-	-	-
CO3	2	2	2	-	1	-	-	-	-	-	-	-
CO4	2	2	2	-	1	-	-	-	-	-	-	-
CO5	2	2	3	-	1	-	-	-	-	-	-	-
CO6	2	2	3	-	1	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	1
CO5	2	1
CO6	2	1

Unit – I

Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is Auto Scanning

Unit – II

Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Auto wiring, Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices: Spring Boot Application

Unit – III

Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting, Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices-Spring Data JPA

Unit – IV

Web Services: Why Web services, SOA-Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, REST ful Web Services, How to create REST ful Services

Unit – V

Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints

Text Books:

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web References:	
1.	Dependency Injection in spring-javat point
2.	Auto wiring in Spring- javat point
3.	https://docs.spring.io/spring-boot/docs/2.0.x/reference/html/using-boot-using-spring-boot-application-annotation.html
4.	Auto wiring in Spring – javat point, https://www.baeldung.com/spring-bean-scopes
5.	Spring Boot Logging How does logging works inspring boot with example (educba.com)
6.	Spring AOP Tutorial Aspect Oriented Programming-javat point
7.	Spring Boot Best Practices(javaguides.net)
8.	Introduction to Spring Data JPA SpringHow
9.	https://asbnotebook.com/spring-data-jpa-crud-example/ , https://www.bezkoder.com/spring-boot-jpa-crud-rest-api/
10.	Pagination and Sorting using Spring Data JPA – Paging And Sorting Repository (javaguides.net)
11.	https://www.javaguides.net/2018/11/spring-data-jpa-query-creation-from-method-names.html , https://www.javaguides.net/2022/02/spring-data-jpa-namedqueries-example.html
12.	https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
13.	https://javadeveloperzone.com/spring/spring-declarative-transaction-management/
14.	https://javabeat.net/spring-data-custom-repository/

15.	https://www.jrebel.com/blog/jpa-application-performance-best-practices
16.	https://www.javatpoint.com/service-oriented-architecture , https://www.javatpoint.com/web-services-tutorial
17.	https://www.javatpoint.com/soap-web-services , https://www.javatpoint.com/restful-web-services
18.	RESTful Web Services - javatpoint
19.	https://www.javatpoint.com/restful-web-services-spring-boot
20.	https://www.javatpoint.com/restful-web-services-spring-boot https://dzone.com/articles/lifecycle-of-a-request-response-process-for-a-spring-boot-app
21.	https://www.ibm.com/docs/en/was/8.5.5?topic=applications-defining-uri-patterns-resources-in-restful
22.	https://www.baeldung.com/exception-handling-for-rest-with-spring
23.	https://howtodoinjava.com/spring-boot2/resttemplate/spring-restful-client-resttemplate-example/
24.	https://www.javatpoint.com/restful-web-services-versioning

Web Links: [Courses mapped to Infosys Spring board platform]

- 1 https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview[Spring5BasicswithSpringBoot]
- 2 https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview[Spring DataJPWithBoot]
- 3 https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview[SpringREST]

COMPOSITE MATERIALS

(Open Elective-IV)

VII Semester
Course Code: 201CE7O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identify the various matrices, reinforcements and their combinations in composite materials.
- CO2: Select composite materials for suitable applications.
- CO3: Develop suitable Metal Matrix Composites.
- CO4: Identify perfect Ceramic Matrix Composites for high temperature applications.
- CO5: Choose various combinations of fibres and resins.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to Composites:

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix and their role- Metal matrix composites (MMC), Ceramic matrix composites (CMC), Polymer matrix composites (PMC)- Reinforcement – Particle reinforced composites-Fibre reinforced composites- Rule of mixtures- Applications of various types of composites- Introduction to nano materials.

Unit – II

Mechanical Properties - Stiffness – Strength

Geometrical aspects – volume and weight fraction. Unidirectional continuous fibre, discontinuous fibers, Short fiber systems, woven reinforcements –Mechanical Testing: Determination of stiffness and strengths of unidirectional composites; tension, compression, flexure and shear.

Unit – III

Metal Matrix Composites:

Metal Matrix, Reinforcements – particles – fibres, Effect of reinforcement - Volume fraction. Various types of Metal Matrix Composites, Characteristics of MMC, Alloy vs. MMC, Advantages and limitations of MMC –Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

Unit – IV**Ceramic Matrix Composites:**

Engineering ceramic materials – Properties – Advantages – Limitations – Monolithic ceramics - Need for CMCs – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – Non oxide Ceramics – Aluminium oxide – Silicon nitride – Reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

Unit – V**Polymer Matrix Composites:**

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non-woven random mats – Various types of fibres. Methods for producing PMC - Hand layup processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre Reinforced Plastics (FRP), Glass fibre Reinforced Plastics (GRP).

Text Books:

1. Mathews F.L. and Rawlings R.D., “Composite materials: Engineering and Science”, Chapman and Hall, London, England, 2006
2. Sharma S.C., “Composite materials”, Narosa Publications, 2004.

Reference Books:

1. Autar.K.Kaw, “Mechanics of Composite Materials”, CRC Press, 2006.
2. Strong A.B., “Fundamentals of Composite Manufacturing”, SME, 2008.
3. Clyne T.W. and Withers P.J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 2003

Web Links:

1. NPTEL : NOC:Introduction to Composites (Mechanical Engineering) (digimat.in)
2. Mechanics of Composite Materials - Lecture 1: Motivation - YouTube
3. Mod-05 Lec-01 Composite Materials - YouTube

BASICS OF RS&GIS
(Open Elective-IV)

VII Semester
Course Code: 201CE7O05

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the evolution of Remote Sensing and GIS, the energy interactions in the atmosphere and earth surface features.
- CO2: Elaborate on photogrammetry and various satellites.
- CO3: Interpret the images for preparation of thematic maps.
- CO4: Develop GIS based raster and vector data models.
- CO5: Explain navigation applications based on GCS and GPS systems.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

History and Basic Concept of Remote Sensing:

Introduction to remote sensing: Evolution of Remote Sensing- use of hot air balloons, pigeons and platforms of remote sensing, low-medium-high altitude imaging.

Basic concepts of remote sensing: Electromagnetic spectrum and its interaction with atmosphere, energy interaction with the earth surfaces characteristics of remote sensing systems.

Unit – II

Photogrammetry; Aerial and Terrestrial; photo interpretation. Sensors; Radar imaging; colour scanners; thematic mapper. Introduction to space agencies - IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal).

Unit – III

Geographic Information System:

Introduction to GIS; Components of a GIS, Geospatial Data: Spatial Data and Attribute data, Joining Spatial and Attribute data.

Image interpretation:

Introduction, elements of visual image interpretations, digital image processing- image pre-processing, image enhancement, image classification, supervised classification, unsupervised classification using GIS Environ.

Unit – IV

Data Models: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database, Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion

Unit – V

Coordinate Systems:

Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters, commonly used Map Projections. Global positioning system and various navigation applications.

Text Books:

1. Textbook of Remote Sensing and Geographical Information Systems, by Anji M. Reddy · 2018, BS Publications.
2. Remote Sensing and GIS, Basudev Bhatta, Oxford Publishers 2015
3. Remote Sensing and GIS, Thomas M.Lillesand and Kiefer, John Willey 2008

Reference Books:

1. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.
2. Introduction to Geographic Information System, Kang-Tsung Chang, McGraw- Hill 2015.

Web Links:

1. http://geology.wlu.edu/harbor/geol260/lecture_notes/notes.html
2. <https://lecturenotes.in/subject/572/remote-sensing-and-gis-rsg>
3. <https://nptel.ac.in/downloads/105108077/>

SAFETY ENGINEERING
(Open Elective-IV)

VII Semester
Course Code: 201CE7O06

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Develop management plans to prevent accidents in construction Industry.
- CO2: Prepare plans to safe guard workers in construction of high risk Buildings.
- CO3: Ensure safety while operating construction machinery.
- CO4: Outline safety plans for demolition of buildings .
- CO5: Prepare fire safety plans for a given building.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Accidents Causes and Management Systems:

Problems impeding safety in construction industry- causes of fatal accidents, types and causes of accidents related to various construction activities, human factors associated with these accident – construction regulations, contractual clauses – Pre contract activates, preconstruction meeting - design aids for safe construction – permits to work

– quality assurance in construction - compensation – Recording of accidents and safety measures – Education and training.

Unit - II

Hazards of Construction and Prevention:

Excavations, basement and wide excavation, trenches, shafts – scaffolding , types, causes of accidents, scaffold inspection checklist – false work – erection of structural frame work, dismantling – tunneling – blasting, pre blast and post blast inspection – confined spaces – working on contaminated sites – work over water – road works – power plant constructions – construction.

Unit - III

Working At Heights:

Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress – safe use of ladders- Scaffoldings , requirement for safe work platforms, stairways, gangways and ramps – fall prevention and fall protection , safety belts, safety nets, fall arrestors, controlled access zones, safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies.

Unit – IV**Construction Machinery:**

Selection, operation, inspection and testing of hoisting cranes, mobile cranes, tower cranes, crane inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors

– concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumper, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills, grinding tools, manual handling scaffolding, hoisting cranes – use of conveyors and mobile cranes – manual handling.

Unit – V**Safety in Demolition Work:**

Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods – interesting experiences at the construction site against the fire accidents.

Fire Safety:

Fire –fire load-control and institutional fire protection systems, Fire Hydrant and extinguishers, Electrical Hazards, protection and interlock- Discharge rod and earthing device, safety in the use of portable tools. Emergency planning and preparedness. Marking of Route Fire Exist.

Text Books:

1. ‘Safety in the Build Environment’ by Jnathea D.Sime, London, 2010
2. ‘Reliability Maintenance and Safety Engineering’, by Gupta A K, Laxmi Publications, New Delhi.

Reference Books:

1. ‘Construction hazard and Safety Hand book’ by Hudson, R., Butter Worth’s, 1985.
2. ‘Construction Safety Hand Book’ by V.J.Davies and K.Thomasin, Thomas Telford Ltd., London, 1990.

Web Links:

1. nptel.ac.in/courses/105103093/
2. nptel.ac.in/courses/105103093/22

INDUSTRIAL ELECTRICAL SYSTEMS
(Open Elective-IV)

VII Semester
Course Code: 201EE7O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- CO2: Illustrate the residential and commercial electrical systems.
- CO3: Design the residential and commercial lightning systems.
- CO4: Explain various components of industrial electrical systems.
- CO5: Analyze and select the proper size of various electrical system components.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

Unit - II

Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit - III

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaires like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Unit – IV

Industrial Electrical Systems: HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Unit – V

Industrial Electrical Systems II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation (6 Hours) Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text Books:

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

Reference Books:

1. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
2. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.
3. Web site for IS Standards.

Web Links:

1. <https://www.electricityforum.com/iep/building-automation>
2. <https://nptel.ac.in/courses/108105060/>

ELECTRICAL MATERIALS

(Open Elective-IV)

VII Semester
Course Code: 201EE7O05

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identify various types of dielectric materials, their properties in various conditions
- CO2: Analyze magnetic materials and their behavior.
- CO3: Evaluate semiconductor materials and technologies.
- CO4: Develop Knowledge on Materials used in electrical engineering and applications.
- CO5: Explain about special purpose Materials used in electrical engineering.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

Unit - II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

Unit - III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI)

Unit - IV

Materials for Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetallic fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

Unit – V

Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

Text Books:

1. A course in Electrical Engineering Materials by R K Rajput, Laxmi Publications.
2. A course in Electrical Engineering Materials by T K Basak, New Age Science Publications

Reference Books:

1. Electrical Engineering Materials by TTTI Madras, McGraw Hill Education
2. Electrical Engineering Materials by Adrianus J. Dekker, PHI Publication.
3. A course in Electrical Engineering Materials by S. P. Seth, P. V. Gupta, Dhanpat Rai & Sons.

Web Links:

1. <https://nptel.ac.in/courses/113/102/113102080/>
2. <https://nptel.ac.in/courses/113/107/113107078/>
3. <https://nptel.ac.in/courses/122/102/122102008/>

ELECTRICAL SAFETY (Open Elective-IV)

VII Semester
Course Code: 201EE7O06

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Describe electrical hazards and safety equipment.
- CO2: Analyze and apply various grounding and bonding techniques.
- CO3: Select appropriate safety method for low, medium and high voltage equipment
- CO4: Participate in a safety team.
- CO5: Carry out proper maintenance of electrical equipment by understanding various Standards.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Hazards of Electricity and Electrical Safety Equipment: Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one line diagram- electrician's safety kit.

Unit – II

Grounding of Electrical Systems and Equipment: General requirements for grounding and bonding-definitions- grounding of electrical equipment-bonding of electrically conducting materials and other equipment- connection of grounding and bonding equipment- system grounding- purpose of system grounding-grounding electrode system- grounding conductor connection to electrodes-use of grounded circuit conductor for grounding equipment- grounding of low voltage and high voltage systems.

Unit – III

Safety Procedures and Methods: The six step safety methods- pre job briefings - hot-work decision tree-safe switching of power system- lockout-tag out- flash hazard calculation and approach distances-calculating the required level of arc protection-safety equipment, procedure for low, medium and high voltage systems- the one-minute safety audit.

Unit – IV

Safety Management and Organizing Structure: Electrical safety program structure, development- company safety team- safety policy program implementation- employee electrical safety teams- safety meetings- safety audit accident prevention- first aid- rescue techniques-accident investigation.

Unit – V

Electrical Maintenance and Legal Safety Requirements and Standards: Safety related case for electrical maintenance- reliability centred maintenance (RCM) - eight step maintenance program- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code standard for electrical safety in work place- occupational safety and health administration standards, Indian Electricity Acts related to Electrical Safety.

Text Books:

1. John Cadick, Mary Capelli-Schellpfeffer, Dennis Neitzel, Al Winfield, 'Electrical Safety Handbook', McGraw-Hill Education, 4 th Edition.

Reference Books:

1. Maxwell Adams.J, 'Electrical Safety- a guide to the causes and prevention of electric hazards', The Institution of Electric Engineers, IET.
2. Ray A. Jones, Jane G. Jones, 'Electrical Safety in the Workplace', Jones & Bartlett Learning.

Web Links:

1. <http://nptel.ac.in/courses/103106071/5>
2. <https://www.electricalsafetyfirst.org.uk>

ENTREPRENEURSHIP DEVELOPMENT AND INCUBATION
(Open Elective-IV)

VII Semester
Course Code: 201ME7O05

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Describe the meaning and concepts of entrepreneurship development
- CO2: Apply the business plan for preparation and evaluation of project.
- CO3: Explain about Institutional Support to Entrepreneur and MSMEs
- CO4: Explain about the Opportunities of Entrepreneurship Internationally.
- CO5: Explain about Informal Risk Capital, Venture capital and Social responsibility for entrepreneurship
- CO6: Understand and apply the research on venture capital and Risk for Entrepreneurship socially incubations.

Mapping of Course Outcomes with Program Outcomes:

CO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	2	-	-	1	-	-
CO2	-	-	-	-	-	1	2	-	-	1	-	-
CO3	-	-	-	-	-	3	2	-	-	1	1	-
CO4	-	-	-	-	-	3	2	-	-	1	1	-
CO5	-	-	-	-	-	1	2	-	-	1	-	-
CO6	-	-	-	-	-	1	2	-	3	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Entrepreneur &Entrepreneurship:

Entrepreneur &Entrepreneurship: Meaning of entrepreneur - Evolution of the concept - Functions of an Entrepreneur - Types of Entrepreneur - Intrapreneur- an emerging class - Concept of Entrepreneurship - Evolution of Entrepreneurship - Development of Entrepreneurship - Entrepreneurial Culture - Stages in entrepreneurial process.

Unit – II

Business Planning Process:

Meaning of business plan - Business plan process - Advantages of business planning - Marketing plan - Production/operations plan - Organization plan - Financial plan - Final Project Report with Feasibility Study - preparing a model project report for starting a new venture.

Unit – III

Institutions supporting Entrepreneurs

Small industry financing institutions in developing countries - A brief overview of financial institutions in India - Central level and state level institutions - SIDBI - NABARD - IDBI - SIDCO - Indian Institute of Entrepreneurship - DIC - Single Window - Latest Industrial Policy of Government of India.

Unit – IV

International Entrepreneurship Opportunities:

The nature of international entrepreneurship - Importance of international business to the firm - International versus domestic entrepreneurship - Stages of economic development - Entrepreneurship entry into international business - exporting - Direct foreign investment - barriers to international trade.

Unit – V

Informal Risk Capital and Venture Capital:

Informal risk capital market - venture capital - nature and overview - venture capital process - locating venture capitalists - approaching venture capitalists. Social Entrepreneurship: Social enterprise-need - types - characteristics and benefits of social enterprises-Social entrepreneurship - Rural entrepreneurship, MSME Policies. Make-In India, Start-Up India, Stand-Up India.

Text Books:

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012
2. VSP Rao, Kuratko: "Entrepreneurship", Cengage Learning, New Delhi, 2011.
3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012.

Reference Books:

1. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011.
2. Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi, 2012
3. P.C.Shekhar: "Entrepreneurship Development", Everest Publishing House, New Delhi, 2011.
4. R.H. Hisrich, M.P. Peters and D.A. Shepherd: "Entrepreneurship" Mc Graw Hill Irwin, 8 th Edition, 2010.
5. Ryszard Praszkier& Andrzej Nowak: "Social Entrepreneurship: Theory and Practice Paperback – Illustrated", Cambridge University Press, New York-February 2, 2012.

Web Links:

1. <http://nptel.ac.in/courses>
2. <https://www.tutorialspoint.com>
3. www.tutorialspoint.com

AUTOMOTIVE SAFETY
(Open Elective-IV)

VII Semester
Course Code: 201ME7O06

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identity different safety systems and vehicle structural crashworthiness
- CO2: Analyse and simulate vehicle in barrier impacts and its influence on Biomechanics
- CO3: Design vehicle safety systems as an Active Safety aspects
- CO4: Analyse the Occupant protection as a Passive Safety aspects
- CO5: Analyse pedestrian safety during crashing
- CO6: Analyse the vehicle for its structural crash worthiness.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	1	-	-	-	-	-	-
CO2	3	2	1	-	-	1	-	-	-	-	-	-
CO3	3	2	1	-	-	1	-	-	-	-	-	-
CO4	3	2	1	-	-	1	-	-	-	-	-	-
CO5	3	2	1	-	-	1	-	-	-	-	-	-
CO6	3	2	1	-	-	1	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Accidental Avoidance

Introduction; Human Factors; Comfort and Ergonomics; Acceleration and Braking; Adaptive Cruise Control; Brakes; Brakes-by-wire; Antilock Braking system; Electronic Brake Booster; Electronic differential system; Anti-skid control device

Unit – II

Biomechanics and Occupant Simulation

Introduction, Injury tolerance limits; external injuries; internal injuries- Concussions, spinal injuries, chest injuries; criteria in rule making process – head protection, chest protection; neck injuries; pelvic; leg and knee; pedestrian protection; body part test devices- head impact. Torso impact; 3D dummies; frontal/rear collision; rollover and lateral impact.

Unit – III**Vehicle Body**

Introduction; Low- speed impact; vehicle body tests- seat and seat belt; anchorage points tests; roof strength; vehicle side structures; dynamic vehicle simulation tests- frontal collision; pole tests; frontal car -to – car crash; lateral collisions; rear end collisions; and rollover.

Unit – IV**Occupant Protection**

Introduction; vehicle compartment; restraints systems – seat belts; air bags; sensors for restraint systems; child restraints; seal belt load limiter; passive restraints; head restraints;

Unit – V**Pedestrian Protection**

Introduction; pedestrian hit by front of the car; NCAP Test; Technical solutions for vehicles in accidents- engine compartment with a lower front hood, pedestrian via front hood air bags.

Text Books:

1. George A Peters and Barbara J. Peters, Automotive Vehicle Safety, 2002, CRC Press
2. Hans- Leo Ross, Functional safety for road vehicles, Springer, 2016

Reference Books:

1. Peter Johnannes Bergmiller Towards functional safety in drive – by – wire vehicles, Springer 2015.
2. Ulrich Seiffert and Lothar Wech., Automotive Safety Handbook. 2nd edition. , 2007, SAE.

Web Links:

1. <https://www.ritindia.edu/Automobile/images/Curriculum/PG-Automotive-Technology-2021-23.pdf>

FABRICATION PROCESSES
(Open Elective-IV)

VII Semester
Course Code: 201ME7007

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the fundamentals of Casting and Casting Processes.
- CO2: Discuss the basics of Welding and types of Welding processes.
- CO3: Illustrate HAZ, welding defects and testing methods of welded joints.
- CO4: Summarize the various technological approaches applied to the different hot working and cold working operations.
- CO5: Describe the concept of various Extrusion processes and forces in extrusion.
- CO6: Explain the concept of Forging processes, Forging defects and forces in forging operations.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	2	1	-	-	-	-	-	1
CO2	3	2	-	-	2	1	-	-	-	-	-	1
CO3	3	-	-	-	2	1	-	-	-	-	-	1
CO4	3	-	2	-	2	1	-	-	-	-	-	1
CO5	3	-	2	-	2	1	-	-	-	-	-	1
CO6	3	-	-	-	2	1	-	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction;Properties of moulding sands.

Methods of Melting-Crucible melting and cupola operation–Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems– Riser–Function, types of Riser and Riser design.

Unit – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arcwelding, forge welding, submerged arcwelding, Resistance welding, Thermit welding. Inert Gas Welding-TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects–causes and remedies; destructive and non-destructive testing of welds .

Unit – III

Hot working, cold working, strain hardening, recovery, recrystallization, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing–Bending and forming–Drawing and its types–wire drawing and Tube drawing–coining–Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above processes.

Unit – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion – Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

Unit – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

Text Books:

1. Manufacturing Technology 5th edition/P.N.Rao/McGrawHill
2. Manufacturing Engineering and Technology 7th edition /KalpakjinS/Pearson.

Reference Books:

1. Metal Casting 2nd edition / T.V Ramana Rao/ New Age
2. Metal Fabrication Technology 1st edition/Mukherjee/PHI
3. Production technology 5th edition / R.K.Jain
4. Welding Processes and Technology 1st edition/ Dr. R.S. Parmar

Web Links:

1. <https://nptel.ac.in/courses/112107144>
2. <https://www.alphamanufacturing.co.uk>
3. <https://www.thomasnet.com/articles/custom-manufacturing-fabricating/overview-of-metal-fabrication-processes/>
4. <https://nptel.ac.in/courses/103106075>
5. <https://nptel.ac.in/courses/112107219>

SMART MATERIALS

(Open Elective-IV)

VII Semester
Course Code: 201ME7008

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the classification and properties of smart materials
- CO2: Explain the properties and applications of High bandwidth and low strain smart sensors
- CO3: Explain the functioning and control parameters of Actuators
- CO4: Explain about micro and macro mechanics of smart composites.
- CO5: Design a smart composite using Finite element modelling process
- CO6: Explain the advances in smart structures and materials

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	1	-	-	-	-	1
CO2	3	1	-	-	-	-	2	-	-	-	-	1
CO3	3	1	-	-	-	-	2	-	-	-	-	1
CO4	3	2	-	-	-	-	2	-	-	-	-	1
CO5	3	2	-	-	-	-	2	-	-	-	-	1
CO6	3	1	-	-	-	-	1	-	-	-	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

OVERVIEW OF SMART MATERIALS : Introduction to Smart Materials, Principles of Piezoelectricity, Perovskite Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rareearth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rheological Fluids

Unit – II

HIGH-BAND WIDTH,LOW STRAIN SMART SENSORS: Piezo electric Strain Sensors, In-plane and Cut-off Plane Sensing, Shear Sensing, Accelerometers, Effect of Electrode Pattern, Active Faber Sensing, Magnetostrictive Sensing, Villani Effect, Mattac in Effect and Nagaoka-Honda Effect, Magnetic Delay Line Sensing, Application of Smart Sensors for Structural Health Monitoring (SHM), System Identification using Smart Sensors

Unit – III

SMART ACTUATORS: Modelling Piezo electric Actuators, Amplified Piezo Actuation–Internal and External Amplifications, Magnetostrictive Actuation, Joule Effect, Wiedemann Effect, Magneto volume Effect, Magnetostrictive Mini Actuators, IPMC and Polymeric Actuators, Shape Memory Actuators, Active Vibration Control, Active Shape Control, Passive Vibration Control, Hybrid Vibration Control.

Unit – IV

SMART COMPOSITES: Review of Composite Materials, Micro and Macro-mechanics, Modelling Laminated Composites based on Classical Laminated Plate Theory, Effect of Shear Deformation, Dynamics of Smart Composite Beam, Governing Equation of Motion, Finite Element Modelling of Smart Composite Beams.

Unit – V

ADVANCES IN SMART STRUCTURES & MATERIALS: Self-Sensing Piezo electric Transducers, Energy Harvesting Materials, Artophagous Materials, Self-Healing Polymers, Intelligent System Design, Emergent System Design

Text Books:

1. Smart Materials and Structures/ M. V. Gandhiand. So, Thompson/ Chapman & Hall, London; New York, 1992.
2. Brian Culshaw, SmartStructures and Materials, Artech House, 2000.
3. Gauenzi, P., Smart Structures, Wiley, 2009
4. Cady, W. G., Piezoelectricity, Dover Publication.

Reference Books:

1. Srinivasan, A. V. and Michael McFarland, D., "Smart Structures: Analysis and Design", Cambridge University Press, 2009.
2. Michelle Addington and Daniel L. Schodek, "Smart Materials and Technologies: For the Architecture and Design Professions", Routledge 2004.
3. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.
4. J. W. Dally and W.F. Riley, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.

Web Links:

1. <https://nptel.ac.in/courses/112/104/112104251/>
2. <https://nptel.ac.in/courses/112/104/112104173>

FUNDAMENTALS OF IMAGE PROCESSING
(Open Elective-IV)

VII Semester
Course Code: 201EC7O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Infer the fundamental components of digital image processing.
- CO2** Illustrate image enhancement techniques.
- CO3** Compare image restoration techniques.
- CO4** Infer the color image processing methods.
- CO5** Make use of morphological operators for image processing.
- CO6** Interpret image segmentation techniques.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Unit – II

Image Enhancement and Restoration: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods, A model of the image degradation/restoration process, Noise models, Inverse filtering, Minimum mean square error (Wiener) filtering.

Unit – III

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening, noise in color images.

Unit – IV

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds

Unit – V

Image segmentation: Fundamentals, point, line, edge detection, thresholding, and region – based segmentation, Image segmentation based on color.

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

Reference Books:

1. Jayaraman, S. Esakkirajan, and T. Veerakumar,” Digital Image Processing”, Tata McGraw-Hill Education, 2011
2. B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.

Web Links:

1. <http://www.imageprocessingplace.com/>.
2. [http://nptel.ac.in/courses/117105079/\(Prof.P.K.Biswas,IIT, Kharagpur\)](http://nptel.ac.in/courses/117105079/(Prof.P.K.Biswas,IIT, Kharagpur))
3. <https://sisu.ut.ee/imageprocessing/avaleht>
4. <https://www.coursera.org/learn/digital#ratings>
(Fundamentals of digital image and video processing, Aggelos K. Katsaggelos, University of Northwestren)
5. <https://www.coursera.org/courses?languages=en&query=image+processing>

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Open Elective-IV)

VII Semester
Course Code: 201EC7O05

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Outline the performance characteristics of measuring Instruments.
- CO2** Select signal generators for the given application.
- CO3** Contrast wave analyzers based on their performance.
- CO4** Interpret the working principle of oscilloscopes.
- CO5** Choose a suitable bridge for parameter measurement.
- CO6** Make use of transducers for physical parameter measurement.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	2	3	1	-	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Performance Characteristics of Instruments:

static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, errors in measurement, Dynamic characteristics- speed of response, fidelity, lag, dynamic error, DC voltmeters, multi range, range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt, thermocouple type RF ammeter, Ohmmeters series type, shunt type, multi-meter for voltage, current, and resistance measurements.

Unit – II

Signal Generators & Wave Analyzers:

Fixed and variable, AF oscillators, standard and AF sine and square wave signal generators, Function generators, square, pulse, Random noise, sweep, arbitrary wave form, Wave analyzers, Harmonic distortion analyzers, spectrum analyzers, Digital Fourier analyzers.

Unit – III

Oscilloscopes:

CRT features, Vertical amplifiers, Horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits. Simple CRO, triggered sweep CRO, dual beam CRO,, dual trace oscilloscope, sampling

oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO, active and passive, attenuator type.

Unit – IV

AC Bridges:

Measurement of Inductance, Maxwell's bridge, Anderson bridge, Measurement of Capacitance, Schering bridge, Wheatstone bridge, Wein bridge, Errors and precautions in using bridges, Q meter.

Unit – V

Transducers:

Active and passive transducers, resistance, capacitance, inductance, strain gauges, LVDT, piezo electric transducers, Resistance thermometers, thermocouples, thermistors, sensitists, Measurement of physical parameters-force, pressure, velocity, humidity, moisture, speed, proximity and displacement, data acquisition systems

Text Books:

1. Electronic Instrumentation, H.S.Kalsi, 2nd edition, Tata McGraw Hill, 2004
2. Modern electronic Instrumentation and measurement techniques, A.D.Helfric,W.D.Cooper, 5th edition, PHI, 2002.

Reference Books:

1. Electronic Instrumentation and measurements,David A.Bell, 2nd edition, PHI, 2003
2. Electronic test Instruments, analog and digital measurements, Robert A.Wittie, 2nd edition, Pearson education, 2004.
3. Electronic measurements and Instrumentations, K.Lal Kishore, Pearson education, 2005

Web Links:

1. <https://www.allaboutcircuits.com/textbook/alternating-current/chpt-12/ac-bridge-circuits/>
2. <https://www.science-ebooks.com/bridge-circuit.html>

SENSORS AND ACTUATORS
(Open Elective-IV)

VII Semester
Course Code: 201EC7O06

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1** Classify various sensors/transducers based on their applications.
- CO2** Categorize various types of Resistive, Inductive and Capacitive Sensors.
- CO3** Analyze various approaches, procedures and results related to Thermal sensors.
- CO4** Analyze various approaches, procedures and results related to Magnetic sensors.
- CO5** Examine the radiation sensors based on their characteristics.
- CO6** Apply Smart Sensors in the field of Communication, Automation and Manufacturing

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	-	-	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	2	3	2	2	-	-	-	-	-	-	-	-
CO4	2	3	2	2	-	-	-	-	-	-	-	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-
CO6	2	2	3	1	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Sensors / Transducers:

Principles – Classification – Parameters – Characteristics – Environmental Parameters (EP) – Characterization.

Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors:- Electrostatic Transducer– Force/Stress Sensors Using Quartz Resonators – Ultrasonic Sensors.

Unit – II

Thermal Sensors:

Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermo sensors – Helium Low Temperature Thermometer – Nuclear Thermometer – Magnetic Thermometer – Resistance Change Type Thermometric Sensors –Thermo emf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry – Noise Thermometry – Heat Flux Sensors.

Magnetic sensors: Introduction – Sensors and the Principles Behind – Magneto-resistive Sensors – Anisotropic Magneto resistive Sensing – Semiconductor Magneto resistors– Hall Effect and Sensors – Inductance and Eddy Current Sensors– Angular/Rotary Movement Transducers – Synchros – Synchro-

resolvers - Eddy Current Sensors – Electromagnetic Flow meter – Switching Magnetic Sensors SQUID Sensor

Unit – III

Radiation Sensors:

Introduction – Basic Characteristics – Types of Photo sensors /Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors.

Electro analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential – Standard Hydrogen Electrode (SHE) – Liquid Junction and Other Potentials – Polarization – Concentration Polarization– Reference Electrodes - Sensor Electrodes – Electro ceramics in Gas Media. Radiation Sensors –Quartz Crystal Thermoelectric Sensors – NQR Thermometry – Spectroscopic Thermometry – Noise Thermometry – Heat Flux Sensors.

Unit – IV

Smart Sensors:

Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation

Sensors-Applications: Introduction – On-board Automobile Sensors (Automotive Sensors)– Home Appliance Sensors – Aerospace Sensors — Sensors for Manufacturing –Sensors for environmental Monitoring.

Unit – V

Actuators:

Pneumatic and Hydraulic Actuation Systems- Actuation systems – Pneumatic and hydraulic systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves – Rotary actuators

Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems- Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors

Text Books:

1. D. Patranabis – “Sensors and Transducers” –PHI Learning Private Limited.
2. W. Bolton – “Mechatronics” –Pearson Education Limited.

Reference Books:

1. Sensors and Actuators – D. Patranabis – 2nd Ed., PHI, 2013.
2. Hardware Software Co-Design Principles and Practice, J. Staunstrup, Springer Publications
3. Embedded Systems Architecture, Tammy Noergaard, Elsevier Publications, 2013.

Web Links:

1. <https://www.iitk.ac.in/tkip/workshop/sensors-and-actuators/ppt/sandeep.pdf>
2. <https://www.hella.com/techworld/ae/Technical/Sensors-and-actuators-204/>
3. <https://www.leanix.net/en/blog/iot-devices-sensors-and-actuators-explained>

INTRODUCTION TO MACHINE LEARNING (Open Elective-IV)

VII Semester
Course Code: 201CS7O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the fundamental usage of the concept Machine Learning system with an emphasize on statistical learning
- CO2: Demonstrate various regression techniques and linear models for binary classification
- CO3: Analyze the role of Ensemble Learning Methods and Support Vector Machines in Machine Learning
- CO4: Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning
- CO5: Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit - II

Supervised Learning(Regression/Classification): Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

Unit - III

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification, SVM Regression, Naïve Bayes Classifiers.

Unit - IV

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches

for

Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit – V

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaishman, 25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly

Web Links:

1. <https://www.deeplearning.ai/machine-learningyearning/>
2. <https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. <https://www.udemy.com/course/machinelearning/>

CLOUD COMPUTING
(Open Elective-IV)

VII Semester
Course Code:201CS7O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Interpret the key dimensions of the challenge of Cloud Computing.
- CO2:** Identify the economics, financial, and technological implications for selecting cloud computing for own organization.
- CO3:** Demonstrate concept of virtualization and implementation levels of Virtualization.
- CO4:** Classify various storage systems and models in cloud computing environment.
- CO5:** Analyze the Cloud Security risks and Mechanisms.
- CO6:** Utilize cloud environment platform and tools for actively initiating, installing and developing cloud-based applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	1	1	1	-	-	-	-	-	-	-
CO2	3	-	2	1	1	-	-	-	-	-	-	-
CO3	-	2	3	1	2	-	-	-	-	-	-	-
CO4	-	2	2	3	1	-	-	-	-	-	-	-
CO5	3	1	1	-	1	-	-	-	-	-	-	-
CO6	2	-	1	2	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Introduction to Cloud computing: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, Challenges of cloud computing, Characteristics, Cloud computing applications and security risks.

Unit – II

Virtualization and Virtualization of clusters and datacenters:Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Unit – III

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service

Oriented Architecture, Programming on Amazon AWS and Microsoft Azure.

Unit – IV

Cloud Resource management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two-Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

Unit – V

storage systems:Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. DistributedSystems-ConceptsandDesign,GeorgeCoulouris,JeanDollimore,Tim Kindberg, 4th Edition, Pearson Publication.

Reference Books:

1. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press.
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH.
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecchiola, S Tammaraiselvi, TMH.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview
3. <https://www.javatpoint.com/cloud-computing-tutorial>
4. https://www.tutorialspoint.com/cloud_computing/index.htm

DEEP LEARNING (Open Elective-IV)

VII Semester

Course Code: 201IT7002

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Demonstrate the mathematical foundation of neural network
- CO2:** Explain various machine learning algorithms and their importance for data analysis.
- CO3:** Illustrate the challenges and optimization strategies of deep neural network.
- CO4:** Build a convolutional neural network using different activation functions.
- CO5:** Build and train RNN and LSTMs using sequence modelling.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

Unit – II

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation, and other Differentiation Algorithms.

Unit – III

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

Unit – IV

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis

for Convolutional Networks.

Unit – V

Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press.
2. Josh Patterson and Adam Gibson, “Deep learning: A practitioner’s approach”, O’Reilly Media, First Edition.

Reference Books:

1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers.
2. Deep learning Cookbook, Practical recipes to get started Quickly, Douwe Osinga, O’Reilly, Shroff Publishers.

Web Links:

1. <https://keras.io/datasets/>
2. <http://deeplearning.net/tutorial/deeplearning.pdf>
3. <https://arxiv.org/pdf/1404.7828v4.pdf>

VII Semester
Course Code: 201IT7O03

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Describe Data Science and the skill sets needed to be a data scientist
- CO2:** Apply basic tools for visualizing Data& optimization.
- CO3:** Describe the process of reading and exploring data.
- CO4:** Implement various machine learning algorithms for analyzing various datasets.
- CO5:** Analyze datasets using clustering and recommender systems.
- CO6:** Make use of python libraries to implement machine learning algorithms.

Mapping of Course Outcomes with Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	1	1	-	-	-	-	-	-	-	-
CO2	-	1	2	2	3	-	-	-	-	-	-	-
CO3	-	3	1	1	2	-	-	-	-	-	-	-
CO4	-	2	2	3	2	-	-	-	-	-	-	-
CO5	-	2	2	3	2	-	-	-	-	-	-	-
CO6	2	3	-	-	3	-	-	-	-	-	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2
CO6	-	2

Unit - I

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries default dict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object- Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kw args, Type Annotations, How to Write Type Annotations.

Unit – II

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation.

Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

Unit – III

Getting Data:stdin and stdout, Reading Files, Scraping the Web, Using APIs, Working with Data: Exploring Your DataUsingNamedTuples, Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

Unit – IV

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression.

Unit – V

Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection, Python, Mathematics, NumPy, pandas, scikit-learn, Visualization.

Text Books:

1. Joel Grus, "Data Science from Scratch", O'Reilly
2. Allen B. Downey, "Think Stats", O'Reilly

Reference Books:

1. Doing Data Science: Straight Talk from The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly.
2. Mining of Massive Datasets, 2nd Edition, Jure Lekovic, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press.
3. "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth Matsui, Lean Publications.
4. "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, Springer Publications.

Web Links:

1. <https://github.com/joelgrus/data-science-from-scratch>
2. <https://github.com/donnemartin/data-science-ipython-notebooks>
3. <https://github.com/academic/awesome-datasience>

FLUIDIZATION ENGINEERING (Open Elective-IV)

VII Semester
Course Code: 201PT7O03

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Identify the appropriate industrial application of a fluidized bed
- CO2: Determine the flow regimes of fluidization and construct flow maps.
- CO3: Analyze fluidization behaviour using Davidson and K-L Model, interchange coefficients.
- CO4: Evaluate heat transfer coefficients ,mass transfer coefficients using Bubbling bed model.
- CO5: Determine pressure drop in a turbulent and fast fluidized bed.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction:

The phenomenon of fluidization-Liquid like behaviour of a fluidized bed- Comparison with other contacting methods-Advantages and disadvantages of fluidized beds.

Unit – II

Industrial applications of fluidized beds: Coal gasification-Gasoline from other petroleum fractions; Gasoline from natural and synthesis gases-Heat exchange-Coating of metal objects with plastics-Drying of solids-Synthesis of phthalic anhydride-Acrylonitrile-Polymerization of olefins-FCCU-Fluidized combustion of coal-Incineration of solid waste- Activation of carbon- Gasification of waste- Bio-fluidization.

Unit – III

Fluidization and mapping of regimes:

Minimum fluidization velocity-Pressure drop vs. Velocity diagram-Effect of temperature and pressure on fluidization-Geldart classification of particles- Terminal velocity of particles- Transport disengaging height-Turbulent fluidization- Pneumatic transport of solids-Fast fluidization-Solid circulation systems- Voidage diagram-Mapping of regimes of fluidization.

Unit – IV

Bubbles in dense bed:

Single rising bubbles- Davidson model for gas flow at bubbles- Evaluation of models for gas flow at bubbles. Bubbling fluidized beds: Experimental findings- Estimation of bed Voidages- Physical models: Simple Two phase model; K-L model.

High velocity fluidization:

Turbulent fluidized bed- Fast fluidization- Pressure drop in turbulent and fast fluidization.Solids movement, mixing

Unit – V

Gas dispersion and gas interchange in bubbling beds:

Dispersion of gas in beds- Gas interchange between bubble and emulsion- Estimation of gas interchange coefficients. Particle to gas mass transfer: Experimental Interpolation of mass transfer coefficients- Heat transfer- Experimental heat transfer from the bubbling bed model.

Text Books:

1. Fluidization Engineering, Kunii Diazo and Octave Levenspiel, 2nd Edition, John Wiley & Sons Inc, 1991.
2. Fluidized Bed Technology: Principles and Applications, J.R. Howard, Taylor and Francis, 1989.

Reference Books:

1. Fluidization Fundamentals and Application, Howard Littman et al., American Institute of Chemical Engineers, 1970.
2. Handbook of Fluidization and Fluid Particle Systems, Wen-Ching Yang, CRC Press, 2003.

Web Links:

1. <https://nptel.ac.in/courses/103103132>

FUNDAMENTALS OF MECHANICAL UNIT OPERATIONS
(Open Elective-IV)

VII Semester
Course Code: 201PT7O04

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Outline the fundamental concepts of mechanical unit operations
- CO2: Explain the storage of bulk fluids and flow measurements
- CO3: Explain the flow past immersed solid objects, motion of particles through fluids, beds of solids.
- CO4: Apply filtration, flow through packed and fluidized beds, cross flow filtration
- CO5: Explain the gravity sedimentation, centrifugal separations, flotation.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction of Particulate Solids, Particle Size, Particle Shape and Density, Screening Equipment, Effectiveness and Capacity, Methods of Size Reduction, Equipment for Size Reduction – Crushers, Equipment for Size Reduction – Grinders, Equipment for Size Reduction - Ultrafine Grinders and Cutting Machines

Unit – II

Storage of Bulk Solids, Solids Flow Out and their Flow Patterns, Conveying of Bulk Solids, Size Enlargement Methods, Size Enlargement Equipment,

Unit – III

Flow past Immersed Solid Objects, Motion of Particles through Fluids, Motion of, Flow through Beds of Solids, Flow through Fluidized Beds

Unit – IV

Filtration, Flow through Packed and Fluidized Beds, Cross Flow Filtration and Membrane Separations, Filtration, Principles of Cake Filtration, Filtration Equipment, Cross Flow Filtration

Unit – V

Gravity Sedimentation, Centrifugal Separations, Flootation

Gravity Sedimentation- Classifiers, Gravity Sedimentation - Design of Thickeners, , Centrifugal Separations, Flootation.

Text Books:

1. McCabe W.L., Smith J.C. and Harriott P, "Unit Operations in Chemical Engineering", 7th Edition, McGraw Hill, 2005.
2. Alan S. Foust, Leonard A. Wenzel, Curtis W. Clump, Louis Maus, L.Bryce Anderson, "Principles of Unit Operations", 2nd Edition, John Wiley & Sons, 2010

Reference Books:

1. Lees F.P. Lee's Loss Prevention in Process industries: Hazard Identification, Assessment and control

Web Links:

1. <https://www.processingmagazine.com/material-handling-dry-wet/powder-bulk-solids/article/15587856/preventing-flow-problems-with-reliable-bulk-solids-handling-equipment-design>
2. <https://www.thermopedia.com/content/870/>
3. https://ethz.ch/content/dam/ethz/special-interest/mavt/process-engineering/particle-technology-laboratory-dam/documents/lectures/practica-fourth-semester/2016/Ullmann_Filtration_Fundamentals_2016.pdf
4. <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/gravity-separation>

DRILLING & BLASTING
(Open Elective-IV)

VII Semester
Course Code: 201MI7O02

L T P C
3 0 0 3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Differentiate between explosives.
- CO2: Use blasting accessories along with monitoring and assessment.
- CO3: Analyse problems associated with open cast blasting and mitigation
- CO4: Analyse problems associated with underground blasting and mitigation.
- CO5: Assess blasting in metal mines

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Drilling:

Drillability, mechanics of drilling, major types of drilling machines, Principles of drilling, Types of drill, Drill rods and drill bits -Types and applications, Exploratory and Production Drilling.

Unit – II

Explosives and Blasting Accessories:

Mechanism of blasting, Explosives- types and properties. Selection of explosives, Handling and storage of explosives. Types of initiating systems – Electrical Detonators, Detonating Fuse, Detonating Relays, NONEL, Electronic Detonators, Blasting accessories, exploders. Blast Design in Surface and Underground Mines.

Unit – III

Drilling and Blasting in Surface Mines:

Factors affecting blasting, Blast design - estimation of burden and spacing, estimation of charge requirement; Initiation patterns; secondary blasting – pop and plaster shooting; Problems associated with blasting, Ground vibration and air over pressure

Unit – IV

Drilling and Blasting in Underground Coal Mines:

Blast hole patterns and their applicability, blasting-off-solid, ring hole blasting, calculation of specific charge, specific drilling and detonator factor, initiation patterns.

Unit – V

Drilling and Blasting in Underground Metal mines:

Blast hole patterns and their applicability, blast design for horizontal drivage, long hole blasting, vertical crater retreat blasting.

Text Books:

1. B. Misra, U.M. Rao Karanam, Principle of rock drilling Taylor & Francis, CRC Press, 1998, ISBN-905410788X.
2. "Drilling & Blasting" Minetech by Pradhan G.K., Ghose A.K., Bhubaneswar, India : MINTECH Publications, c1996 200 pages :

Reference Books:

1. Elements of Mining Technology by DJ Deshmukh, Vol. 1, Denett, 2016, First Edition
2. Surface mining, by GB Mishra, Vol.1, Dhanbad Publisher, 1979

Web Links:

1. https://en.wikipedia.org/wiki/Drilling_and_blasting
2. <https://www.rpmdrilling.co.za/blast-hole-drilling-process/>
3. www.railsystem.net/drill-and-blast-method/

AGRICULTURAL STRUCTURES AND PROTECTED CULTIVATION
(Open Elective-IV)

VII Semester
Course Code: 201AG7O02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Classify the poultry houses, dairy barn planning and requirements.
- CO2: Differentiate the different grain storage structures.
- CO3: Classify polyhouses based on construction materials.
- CO4: Apply different irrigation techniques in green house.
- CO5: Plan fertilizer scheduling, rate of application of fertilizers and methods of application.

Mapping of Course Outcomes with Program Outcomes:

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

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO 1	PSO 2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Planning and layout of farmstead. Scope, importance and need for environmental control, physiological reaction of livestock environmental factors, environmental control systems and their design, control of temperature, humidity and other air constituents by ventilation and other methods.

Unit – II

Livestock production facilities, BIS Standards for dairy, piggery, poultry and other farm structures. Design, construction and cost estimation of farm structures; animal shelters, compost pit, fodder silo, fencing and implement sheds, barn for cows, buffalo, poultry, etc

Unit – III

Storage of grains and Causes of spoilage. Water activity for low and high moisture food grains and its limits for storage, Moisture and temperature changes in grain bins; Traditional storage structures and their improvements, Improved storage structures (CAP, hermetic storage, Pusa bin, RCC ring bins). Design consideration for grain storage godowns, Bag storage structures, Shallow and Deep bin, Calculation of pressure in bins and Storage of seeds

Unit – IV

Protected cultivation: Introduction, History, origin, development, national and International Scenario, components of green house, perspective, Types of green houses, polyhouses /shed nets, Cladding materials, Plant environment interactions – principles of limiting factors, solar radiation and transpiration, greenhouse effect, light, temperature, relative humidity, carbon dioxide enrichment. Design and construction of greenhouses – site selection, orientation, design, construction, design for ventilation requirement using exhaust fan system, selection of equipment, Greenhouse cooling system – necessity, methods – ventilation with roof and side ventilators, evaporative cooling, different shading material fogging, combined fogging and fan-pad cooling system, design of cooling system, maintenance of cooling and ventilation systems, pad care etc.

Unit – V

Planting techniques in green house cultivation. Irrigation in greenhouse and net house – Water quality, types of irrigation system, components, design, installation and material requirement. Fogging system for greenhouses and net houses – introduction, benefits, design, installation and material requirement. Fertilization – nutrient deficiency symptoms and functions of essential nutrient elements, principles of selection of proper application of fertilizers, fertilizer scheduling, rate of application of fertilizers, methods, automated fertilizer application. Greenhouse climate measurement, control and management.

Text Books:

1. Pandey, P.H. Principles and practices of Agricultural Structures and Environmental Control, Kalyani Publishers, Ludhiana.
2. Ojha, T.P and Michael, A.M. Principles of Agricultural Engineering, Vol. I, Jain Brothers, Karol Bag, New Delhi.

Reference Books:

1. Venugopal Rao, P. Text Book of Environmental Engineering, Prentice Hall of India, New Delhi.
2. Sahay, K.M. and Singh, K.K. Unit Operations of Agricultural Processing, Vikaspublishing pvt. Ltd, Noida.
3. Singh Brahma and Balraj Singh. 2014. Advances in protected cultivation, New India Publishing Company.
4. Sharma P. 2007. Precision Farming. Daya Publishing House New Delhi.

Web Links:

1. <https://nptel.ac.in/courses/104103020/3>
2. <https://nptel.ac.in/courses/112105050/m24l35.pdf>
3. http://fes.org.in/source-book/SWC%20Source%20Book_final.pdf
4. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=618>
5. <https://agrimoon.com/agricultural-structures-and-environmental-control-pdfbook>

SECURE CODING TECHNIQUES (Job Oriented Elective – IV)

VII Semester
Course Code: 201CS7J02

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Differentiate the objectives of information security.
- CO2:** Summarize the trend, reasons and impact of the recent Cyber attacks.
- CO3:** Describe OWASP design principles while designing a web application.
- CO4:** Explain threat modelling and importance of security in all phases of SDLC
- CO5:** Write secure coding using some of the practices in C/C++/Java and Python programming languages

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	3	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	1	3	1	-	-	-	-	-	-	-
CO4	2	2	3	1	2	-	-	-	-	-	-	-
CO5	2	2	2	1	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	2	-
CO3	2	-
CO4	3	-
CO5	3	-

Unit - I

Network and Information security Fundamentals : Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack.

Unit – II

Introduction to Cyber security: Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS,A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modeling, Microsoft SDL Tool

Unit – III

Secure coding practices and OWASP Top 10: Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing.

Unit – IV

Secure coding practices in C/C++ and Java: Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design inspections, Unit Tests

Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security.

Unit – V

Secure coding in Python: Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests.

Text Books:

1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies
2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.
3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022, Publisher(s): McGraw-Hill, ISBN: 9781264258215
4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky
5. OWASP 2017 Handbook,

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012683751296065536354_shared/contents [Network Fundamentals]
2. https://infyspringboard.onwingspan.com/en/app/toc/lex_3388902307073574000_shared/overview [Introduction to cybersecurity]
3. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015696571596809160 [Certified Secure Software Lifecycle Professional (CSSLP) 2019: Secure Coding Practices]
4. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_0135015689927557129660 [OWASP Top 10: Web Application Security]
5. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350159304097792013093 [Defensive coding fundamentals in C and C++]
6. https://infyspringboard.onwingspan.com/en/viewer/html/lex_auth_01350159172969267213125 [Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications]
7. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01350158164493107211192/overview [Security Programming: Python Scripting Essentials]

Web references:

1. <https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity-myths-vs-reality/>
2. <https://microage.ca/cybersecurity-layering-approach/>
3. <https://www.synopsys.com/glossary/what-is-threat-modeling.html#:~:text=Threat%20modeling%20is%20a%20structured,An%20abstraction%20of%20the%20system>
4. <https://www.microsoft.com/en-us/securityengineering/sdl/threatmodeling>
5. <https://www.checkpoint.com/cyber-hub/threat-prevention/what-is-sandboxing/>
6. <https://www.skillsoft.com/course/defensive-coding-fundamentals-for-cc-f44c02f9-1bcc-11e7-b15b-0242c0a80b07#:~:text=Defensive%20Programming%20is%20a%20methodology,%2C%20testing%2C%20and%20input%20validation.>
7. <https://www.oracle.com/java/technologies/javase/seccodeguide.html>
8. <https://www.skillsoft.com/course/security-programming-python-scripting-essentials-be99adad-1f65-47a8-a4b5-6b5346072b8e>

MANAGEMENT SCIENCE
Common to EEE, CSE & IT

VII Semester
Course Code: 201HS7T01

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Summarize management and motivation theories to renovate the practice of management.
- CO2:** Explain concepts of quality management and use process control charts, concepts and tools of quality engineering.
- CO3:** Illustrate the functional management challenges associated with different changes in the organizations.
- CO4:** Compute Optimum Project Duration and Cost in Crashing of PERT and CPM Networks
- CO5:** Interpret the process of strategic management and to provide basic insights into contemporary management practices.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	2	-	-
CO2	1	-	-	-	1	-	-	-	-	-	3	-
CO3	-	-	-	-	-	-	-	-	1	2	-	-
CO4	3	-	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	-	-	-	1	1	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-

Unit - I

Introduction to Management: Concept nature and importance of Management, Generic Functions of Management, and Evaluation of Management thought, Theories of Motivation, Decision making process, Designing organization structure, Principles of organization & Organizational typology.

Unit – II

Operations Management : Principles and Types of Management, Work study-, Statistical Quality Control, Control charts (P-chart, R-chart, and C-chart) Simple problems, Material Management: Need for Inventory control, EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis), Just-in- Time(JIT) system, Total Quality Management(TQM), Six sigma, supply chain management

Unit – III

Functional Management : Concept of HRM, HRD and PMIR, Functions of HR Manager, Wage payment plans(Simple Problems) ,Job Evaluation and Merit Rating ,Marketing Management, Functions of Marketing, strategies based on product Life Cycle, Channels of distributions.

Unit – IV

Project Management : Development of Network, Difference between PERT and CPM, Fulkerson's Rule, Finding Critical Path, Probability of completion of project, Project Crashing.

Unit – V

Strategic Management : Vision, Mission, Goals, Strategy, Elements of Corporate Planning Process ,Environmental Scanning ,SWOT analysis, Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives, Basic concepts of MIS, ERP, Capability Maturity Model(CMM) Levels, Balanced Score Card.

Text Books:

1. Management Science by Aryasri; Publisher: Tata McGraw Hill, 2009
2. Management by James Arthur, Finch Stoner, R. Edward Freeman, and Daniel R. Gilbert 6th Ed; Publisher: Pearson Education/Prentice Hall.

Reference Books:

1. Principles of Marketing: A South Asian Perspective by Kotler Philip, Gary Armstrong, Prafulla Y. Agnihotri, and Eshan ul Haque , 2010, 13th Edition, Publisher: Pearson Education/ Prentice Hall of India.
2. A Handbook of Human Resource Management Practice by Michael Armstrong, 2010; Publisher: Kogan Page Publishers.
3. Quantitative Techniques in Management by N.D. Vohra, 4th edition, 2010; Publisher: Tata McGraw Hill.
4. Operations Management: Theory and Practice by B. Mahadevan, 2010; Publisher: Pearson Education.

Web Links:

1. www.citehr.com
2. www.nptel.ac.in/courses/122106032
3. www.btechguru.com/courses--nptel--basic-course

PYTHON: DEEP LEARNING
(Skill Oriented Course-V)
Common to CSE&IT

VII Semester
Course Code: 201CS7S01

L	T	P	C
0	0	4	2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Demonstrate the knowledge on the foundations of deep learning.
- CO2:** Apply deep learning techniques to various learning problems.
- CO3:** Discuss the knowledge on open issues in deep learning and have a grasp of the current research directions.
- CO4:** Build different advanced neural networks using the TensorFlow.
- CO5:** Build different advanced neural networks using the Keras.
- CO6:** Build capstone project

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	2	-	-	-	2	2	-	2
CO2	2	2	2	-	3	-	-	-	2	2	-	2
CO3	2	2	2	-	2	-	-	-	2	2	-	3
CO4	2	3	2	-	2	-	-	-	2	2	-	2
CO5	2	3	2	-	2	-	-	-	2	2	-	2
CO6	3	2	2	-	2	-	-	-	2	2	-	2

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	-
CO6	2	-

List of Experiments:

Week - 1

Course name : .Build a Convolution Neural Network for Image Recognition.

Go through the modules of the course mentioned and answer the self-assessment questions given in the link below at the end of the course.

Self Assessment - Deep Learning - Viewer Page | Infosys Springboard (onwingspan.com)

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329493661476454438916_shared/overview

Week - 2

Module name : Understanding and Using ANN : Identifying age group of an actor

Exercise : Design Artificial Neural Networks for Identifying and Classifying an actor using Kaggle Dataset.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330395431313408034595_shared/overview

Week - 3

Module name : Understanding and Using CNN : Image recognition

Exercise: Design a CNN for Image Recognition which includes hyperparameter tuning.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0128119792734781443974_shared/overview

Week - 4

Module name : Predicting Sequential Data

Exercise: Implement a Recurrence Neural Network for Predicting Sequential Data.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329472454671564827503_shared/overview

Week - 5

Module Name: Removing noise from the images

Exercise: Implement Multi-Layer Perceptron algorithm for Image denoising hyperparameter tuning.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01281270187509350411665_shared/overview

Week - 6

Module Name: Advanced Deep Learning Architectures

Exercise: Implement Object Detection Using YOLO.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0133012663485399041534_shared/overview

Week - 7

Module Name: Optimization of Training in Deep Learning

Exercise Name: Design a Deep learning Network for Robust Bi-Tempered Logistic Loss.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01329516827363737649959_shared/overview

Week - 8

Module name: Advanced CNN

Exercise: Build AlexNet using Advanced CNN.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01330395123358105634386_shared/overview

Week – 9

Module name: Autoencoders Advanced

Exercise: Demonstration of Application of Autoencoders.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0135015719462420489929/overview

Week - 10

Module name: Advanced GANs

Exercise: Demonstration of GAN.

https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0135015551717703687718/overview

Week - 11

Module name : Capstone project

Exercise : Complete the requirements given in capstone project

Description: In this capstone, learners will apply their deep learning knowledge and expertise to a real world challenge.

Week - 12

Module name : Capstone project

Exercise : Complete the requirements given in capstone project

List of Augmented Experiments:

13. Write a program for classifying cats and dogs images by using Kaggle dataset from the following link:
<https://www.kaggle.com/datasets/chetankv/dogs-cats-images>
14. Write a program for Gender classification of a person in an image using appropriate data set using CNN.
15. Write a program for Classifying a song by genre by using appropriate data set.
16. Develop a Generative Adversarial Networks (GAN)for Generating MNIST Handwritten Digits using python.

Reference Books:

1. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.

Web Links:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012782105116811264219_shared/contents
2. Deep learning for developers (link will be provided once course is migrated to the Springboard platform)
3. <https://keras.io/datasets/>
4. <http://deeplearning.net/tutorial/deeplearning.pdf>
5. <https://nptel.ac.in/courses/106106184>
6. <https://www.coursera.org/specializations/deep-learning>

**CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY
USING DEVOPS
(Skill Oriented Course–V)
Common to CSE & IT**

VII Semester
Course Code:201CS7S02

L	T	P	C
0	0	4	2

Course Outcomes:

At the end of the Course, Student will be able to:

- CO1:** Summarize the life cycle & principles of agile software development
- CO2:** Develop the fundamental programs using Devops
- CO3:** Analyze the adoption of Devops in Projects and Process
- CO4:** Demonstrate the types of continuous integration and continuous delivery in Devops
- CO5:** Build an automated CICD pipeline using a stack of tools
- CO6:** Develop basic branching and merging in GIT

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1	-	2	-	-	-	2	2	-	1
CO2	1	2	1	-	3	-	-	-	2	2	-	1
CO3	1	3	2	2	2	-	-	-	2	2	-	1
CO4	-	1	3	-	2	-	-	-	2	2	-	1
CO5	2	1	3	-	3	-	-	-	2	2	-	1
CO6	2	3	2	-	3	-	-	-	2	2	-	1

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	1	-
CO2	1	-
CO3	2	-
CO4	2	-
CO5	3	-
CO6	2	-

List of Experiments:

Week – 1

Get an understanding of the stages in software development lifecycle, the process models, values and principles of agility and the need for agile software development. This will enable you to work in projects following an agile approach to software development.

Week – 2

Get a working knowledge of using extreme automation through XP programming practices of test first development, refactoring and automating test case writing.

Week – 3

It is important to comprehend the need to automate the software development lifecycle stages through DevOps. Gain an understanding of the capabilities required to implement DevOps, continuous integration and continuous delivery practices.

Week – 4

Configure the web application and Version control using Git using Git commands and version control operations.

Week – 5

Configure a static code analyzer which will perform static analysis of the web application code and identify the coding practices that are not appropriate. Configure the profiles and dashboard of the static code analysis tool.

Week – 6

Write a build script to build the application using a build automation tool like Maven. Create a folder structure that will run the build script and invoke the various software development build stages. This script should invoke the static analysis tool and unit test cases and deploy the application to a web application server like Tomcat.

Week – 7

Configure the Jenkins tool with the required paths, path variables, users and pipeline views.

Week – 8

Configure the Jenkins pipeline to call the build script jobs and configure to run it whenever there is a change made to an application in the version control system. Make a change to the background color of the landing page of the web application and check if the configured pipeline runs.

Week – 9

Create a pipeline view of the Jenkins pipeline used in Exercise 8. Configure it with user defined messages.

Week – 10

In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static analysis of code.

Week – 11

In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for static unit testing.

Week – 12

In the configured Jenkins pipeline created in Exercise 8 and 9, implement quality gates for code coverage.

List of Augmented Experiments:

17. To fetch and synchronize git repository
18. To perform basic branching and merging in Git
19. To implement form validation
20. To write and read data into/from firebase

Reference Books:

1. Learning Continuous Integration with Jenkins: A beginner's guide to implementing Continuous Integration and Continuous Delivery using Jenkins - Nikhil Pathania ,Packt publication
[<https://www.amazon.in/Learning-Continuous-Integration-Jenkins-Pathania/dp/1>]
2. Jenkins 2 – Up and Running: Evolve Your Deployment Pipeline for Next Generation Automation - Brent Laster, O'Reilly publication
[<https://www.amazon.in/Jenkins-2-Running-Brent-Laster/dp/1491979593>]

Web Links:

1. TOC - Software Engineering and Agile software development | Infosys Springboard (onwingspan.com)
2. Development & Testing with Agile: Extreme Programming - Viewer Page | Infosys Springboard (onwingspan.com)
3. <https://www.javatpoint.com/devops>
4. <https://github.com/nkatre/Free-DevOps-Books-1/blob>

VII Semester
Course Code: 201CS7P01

L	T	P	C
0	0	6	3

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Conduct a technical survey to identify a real world engineering problem
- CO2:** Analyze the industrial plant layout using technical expertise
- CO3:** Compare theoretical and real work environments in technical perspective
- CO4:** Identify the challenges in the execution of operations
- CO5:** Execute the operations and report the results of assigned tasks using modern tools adhering to professional ethics

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	-	-	-	-	-	-	-	1	-	1
CO2	3	-	-	-	-	1	1		-	-	-	1
CO3	3	-	-	-	-	-	-	-	-	1	1	1
CO4	1	1	3	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	2	1	1	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	2
CO3	2	2
CO4	2	2
CO5	2	2

Guidelines:

1. The Internship is a team activity of 3 to 4 students.
2. The students can undergo Industrial Training / Internship at Govt. Organizations, software MNCs or do Research projects in National Laboratories/Academic Institutions like IITs, NITs etc. during summer breaks after completion of VI Semester.
3. Community Service Project is an alternative to the Summer Internship, whenever there is an exigency and students cannot pursue their Summer Internship. A group of students or even a single student can take up the Community Service Project during summer breaks. However, a student can opt for this only once. The students have to identify social problems existing in any geographical area/village and try to solve them technically or suggest to people the necessary solutions for solving these problems.
4. Prior letter and approval from the Head of the Department must be taken before applying to any organization for the fulfilment of this course.
5. Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
6. Each class/section should be assigned with a Project Coordinator.

7. The students are motivated to do projects based on societal needs using emerging technologies like IoT, Machine learning, Deep Learning, Cyber security, cloud computing etc.,
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. After successful completion, students shall submit a summer internship technical report to the department concerned.
10. The student shall appear for the oral presentation before the Project Review Committee (PRC)* and an External Examiner.

RESEARCH METHODOLOGY
Common to all branches

VII Semester
Course Code: 201MC7T01

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the Course, Student will be able to:

- CO1: Explain the characteristics and process of research.
- CO2: Select the research problem by applying problem identification techniques.
- CO3: Formulate and execute research design process.
- CO4: Report the results of research process adhering to professional ethics.
- CO5: Analyze the results of research using statistical measures of central tendency
- CO6: Analyze the results of research using coefficient of variation, correlation and regression

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	2	-	-	-	-	-	2	-	1
CO2	1	-	-	2	-	-	-	-	-	2	-	1
CO3	1	-	-	2	-	-	-	-	-	2	-	1
CO4	1	-	-	2	-	-	-	3	-	2	-	1
CO5	1	-	-	2	2	-	-	-	-	2	-	1
CO6	1	-	-	2	2	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
CO6	-	-

Unit - I

Meaning of Research - Function of Research - Characteristics of Research – Steps involved in Research – Research in Pure and Applied Sciences - Inter Disciplinary Research. Factors which hinder Research – Significance of Research - Research and scientific methods – Research Process– Criteria of good Research – Problems encountered by Researchers – Literature review.

Unit – II

Identification of Research Problem : Selecting the Research problem – Necessity of defining the problem – Goals and Criteria for identifying problems for research. Perception of Research problem – Techniques involved in defining the problem

Unit – III

Research Design : Formulation of Research design – Need for Research design – Features of a good design – Important concepts related to Research design.

Unit – IV

Interpretation and Report Writing: Meaning and Technique of interpretation – Precautions in interpretation – Significance of report writing – Different steps in writing a report – Layout of a Research report.

Unit – V

Statistical Techniques and Tools : Introduction of statistics – Functions – Limitations – Measures of central tendency - Arithmetic mean – Median – Mode – Standard deviation – Co-efficient of variation (Discrete series and continuous series) – Correlation - Regression

Text Books:

1. Research Methodology Methods & Techniques, C.R. Kothari – New Age international Publishers, Reprint 2008
2. A Hand Book of Methodology of Research, Rajammall, P. Devadoss and K. Kulandaivel, RMM Vidyalaya press, 1976

Reference Books:

1. Thesis and Assignment Writing, J. Anderson, Wiley Eastern Ltd., 1997.
2. Research Methodology, Mukul Gupta, Deepa Gupta – PHI Learning Private Ltd., New Delhi, 2011.
3. Fundamentals of Mathematical statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons, New Delhi, 1999.

Web Links:

1. <https://nptel.ac.in/courses/127106227>
2. https://www.youtube.com/watch?v=IZLn9_PA_4s

DATA VISUALIZATION
(Honors)

VII Semester
Course Code:201CS7H01

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Identify and recognize visual perception and representation of data.
- CO2:** Illustrate about projections of different views of objects.
- CO3:** Apply various Interaction and visualization techniques.
- CO4:** Analyze various groups for visualization.
- CO5:** Apply visualizations for volumetric data to present them graphically.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	-	-	-	-	-	-	-	-	-
CO2	1	2	-	3	-	-	-	-	-	-	-	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-
CO5	1	2	2	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	1	-
CO4	2	-
CO5	2	-

Unit - I

Introduction To Data Visualizations And Perception: Introduction of visual perception, visual representation of data, Gestalt principles, Information overload.

Unit – II

Visual Representations: Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

Unit – III

Classification Of Visualization Systems: Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

Unit – IV

Visualization Of Groups: Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization. Various visualization techniques, data structures used in data visualization.

Unit – V

Visualization Of Volumetric Data And Evaluation Of Visualizations: Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations

Text Books:

1. Ward, Grinstein, Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick, 2nd edition, A K Peters, Ltd 2015.

Reference Books:

1. Tamara Munzner, Visualization Analysis & Design, 1st edition, AK Peters Visualization Series 2014
2. Scott Murray, Interactive Data Visualization for the Web, 2nd Edition, 2017

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_mg67/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg67/preview
3. <https://www.coursera.org/learn/datavisualization>
4. <https://www.udemy.com/course/data-visualization-foundations/>
5. <https://www.udemy.com/course/masteringd3js/>

PRINCIPLES OF CYBER SECURITY
(Honors)

VII Semester
Course Code:201CS7H02

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Apply cyber security architecture principles.
- CO2:** Demonstrate the risk management processes and practices.
- CO3:** Appraise cyber security incidents to apply appropriate response
- CO4:** Distinguish system and application security threats and vulnerabilities.
- CO5:** Identify security tools and hardening techniques

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	1	-	-	-	-	-	-	-	-
CO2	-	2	3	1	-	-	-	-	-	-	-	-
CO3	-	1	3	1	-	-	-	-	-	-	-	-
CO4	-	1	3	1	-	-	-	-	-	-	-	-
CO5	-	2	3	1	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	2	-

Unit - I

Introduction to Cyber Security-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

Unit – II

Information Security within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, Risks & Vulnerabilities-Basics of risk management, Operational threat environments, Classes of attacks

Unit – III

Incident Response-Incident categories, Incident response, Incident recovery, Operational security protection-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

Unit – IV

Threat Detection and Evaluation Monitoring-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, Analysis-Network traffic analysis, packet capture and analysis

Unit – V

Introduction to backdoor System and security-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Hardening of operating system

Text Books:

1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, David Alexander, Amanda Finch, David Sutton, BCS publishers, June 2013

Reference Books:

1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2nd Edition, ISACA Publishers, 2019

Web Links:

1. <https://www.coursera.org/specializations/intro-cyber-security>
2. <https://www.coursera.org/specializations/it-fundamentals-cybersecurity>
3. <https://www.udemy.com/course/network-security-course/>
4. https://onlinecourses.nptel.ac.in/noc20_cs33/preview
5. <https://archive.nptel.ac.in/courses/106/105/106105162/>

PRINCIPLES OF CYBER SECURITY
(Minor)

VII Semester
Course Code: 201CS7M01

L T P C
3 1 0 4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Explain the cyber security and security management methods to maintain security protection
- CO2:** Illustrate the nature of secure software development and operating systems.
- CO3:** Summarize the Network management and cloud computing security issues.
- CO4:** Analyze the data privacy techniques and data management.
- CO5:** Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	2	-	-	2	-	-	-	-
CO2	2	3	-	2	2	-	-	-	-	-	-	-
CO3	1	2	-	2	3	-	-	-	-	-	-	-
CO4	1	2	-	3	2	-	-	-	-	-	-	-
CO5	2	1	-	-	2	-	-	3	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	2	-
CO4	3	-
CO5	2	-

Unit - I

Introduction to Cyber Security-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

Unit – II

Information Security within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, Risks & Vulnerabilities-Basics of risk management, Operational threat environments, Classes of attacks

Unit – III

Incident Response-Incident categories, Incident response, Incident recovery, Operational security protection-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

Unit – IV

Threat Detection and Evaluation Monitoring-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, Analysis-Network traffic analysis, packet capture and analysis

Unit – V

Introduction to backdoor System and security-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Hardening of operating system

Text Books:

1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, David Alexander, Amanda Finch, David Sutton, BCS publishers, June 2013

Reference Books:

1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2nd Edition, ISACA Publishers, 2019

Web Links:

1. <https://www.coursera.org/specializations/intro-cyber-security>
2. <https://www.coursera.org/specializations/it-fundamentals-cybersecurity>
3. <https://www.udemy.com/course/network-security-course/>
4. https://onlinecourses.nptel.ac.in/noc20_cs33/preview
5. <https://archive.nptel.ac.in/courses/106/105/106105162/>

INTRODUCTION TO MACHINE LEARNING (Minor)

VII Semester
Course Code:201CS7M02

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Explain the fundamental usage of the concept Machine Learning system with an emphasize on statistical learning
- CO2:** Demonstrate various regression techniques and linear models for binary classification
- CO3:** Analyze the role of Ensemble Learning Methods and Support Vector Machines in Machine Learning
- CO4:** Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning
- CO5:** Discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	2	-	-	-	-	-	-	-	-
CO2	2	2	1	3	-	-	-	-	-	-	-	-
CO3	1	2	1	3	-	-	-	-	-	-	-	-
CO4	1	3	1	2	-	-	-	-	-	-	-	-
CO5	2	1	1	3	-	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit – I

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit – II

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking.

Unit – III

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking.Support Vector Machine: Linear SVM Classification, Nonlinear SVM ClassificationSVM Regression, Naïve Bayes Classifiers.

Unit – IV

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit – V

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods, Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaishman, 25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'reilly

Web Links:

1. <https://www.deeplearning.ai/machine-learningyearning/>
2. <https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. <https://www.udemy.com/course/machinelearning/>

CLOUD COMPUTING (Minor)

VII Semester
Course Code: 201CS7M03

L	T	P	C
3	1	0	4

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Interpret the key dimensions of the challenge of Cloud Computing.
- CO2:** Identify the economics, financial, and technological implications for selecting cloud computing for own organization.
- CO3:** Demonstrate concept of virtualization and implementation levels of Virtualization.
- CO4:** Classify various storage systems and models in cloud computing environment.
- CO5:** Analyze the Cloud Security risks and Mechanisms.
- CO6:** Utilize cloud environment platform and tools for actively initiating, installing and developing cloud-based applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	1	1	1	-	-	-	-	-	-	-
CO2	-	3	2	1	1	-	-	-	-	-	-	-
CO3	-	2	3	1	2	-	-	-	-	-	-	-
CO4	-	2	2	3	1	-	-	-	-	-	-	-
CO5	-	3	1	-	1	-	-	-	-	-	-	-
CO6	-	2	1	2	3	-	-	-	-	-	-	-

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	1
CO3	-	2
CO4	-	1
CO5	-	1
CO6	-	3

Unit - I

Introduction to Cloud computing: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, Challenges of cloud computing, Characteristics, Cloud computing applications and security risks.

Unit - II

Virtualization and Virtualization of clusters and datacenters:Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.

Unit - III

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure.

Unit – IV

Cloud Resource management and Scheduling: Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two-Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.

Unit – V

storage systems:Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. DistributedSystems-ConceptsandDesign,GeorgeCoulouris,JeanDollimore,Tim Kindberg, 4th Edition, Pearson Publication.

Reference Books:

1. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press.
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH.
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecchiola, S Tammaraiselvi, TMH.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs18/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs20/preview
3. <https://www.javatpoint.com/cloud-computing-tutorial>
4. https://www.tutorialspoint.com/cloud_computing/index.htm

**PROJECT
(Full Semester Internship)**

VIII Semester
Course Code:201CS8P01

L	T	P	C
0	0	0	12

Guidelines for Project:

The prime objective of this project work is to imbibe students with technical, analytical and innovative ideas. It's to ensemble the students with theoretical and practical learning pertaining to software applications development, design practices and guidelines/paradigms. A peer of 3-4 students formed as group/team and work under the supervision/mentoring of a departmental faculty. Associating the students to solve from real world problems to various R&D problems identified within the department or sister departments. The team is formed towards fostering the communication and leadership skills among peers, so that they can survive and exercise during their career, abreast. The project work normally includes:

1. Literature survey on existing problem/ topic from viable sources.
2. Eliciting the problem solving approach/methodologies and making the feasibility study.
3. The team should perform an extensive software requirements analysis and ethnographical study.
4. Preparing an abstract/synopsis on the opted topic and present before Departmental Review Committee (DRC).
5. Preparing a roadmap to design, analyze, implement, evaluate/test considering functional, non-functional aspects and finally, deploy the application/product/software service.
6. Detailed Analysis/Design/Modeling/Simulation and experimentation as needed.
7. Final development of product/process conducting testing and specifying the results, conclusions and future directions.
8. Preparing a Dissertation in the standard format for being evaluated by the Department Review Committee (DRC).
9. Final Project presentation / execution before Departmental Review Committee (DRC).

Course Outcomes: At the end of the Course, Student will be able to:

- CO1:** Perceive, leadership and management skills required for project development and product delivery.
- CO2:** Build a model/idea/method/algorithm for societal problems.
- CO3:** Develop inventive or innovative thought making process using software engineering principles.
- CO4:** Apply relevant tools for collecting /processing/Analyze the required information for a project completion.
- CO5:** Adapt to work as a team and adhering professional ethics in presenting the results in written and oral formats.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	-	-	-
CO2	-	1	-	-	-	-	3	-	-	-	2	-
CO3	3	2	-	-	3	-	-	-	-	-	2	-
CO4	3	3		2		3	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	2	3	3	3	3

Mapping of Course Outcomes with Program Specific Outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	1
CO3	2	2
CO4	3	3
CO5	1	1

UNIVERSAL HUMAN VALUES – II
UNDERSTANDING HARMONY
(Common to all branches)

VIII Semester
Course Code: 201MC8T01

L	T	P	C
3	0	0	0

Course Outcomes:

Course Outcomes At the end of the course, the students will be able to

- CO1 Make use of Self-exploration, Continuous Happiness & prosperity, Right understanding and Relationship to live in Harmony principles at all levels
- CO2 Explore the Harmony in the Human-being and Harmony in Self
- CO3 Interpret the Harmony in the Family and Society & Harmony in Human-Human relationship using Justice, Truth, Respect, Prosperity and Co-existence
- CO4 Appraise the Harmony in Nature and Existence using Interconnectedness & mutual fulfilment, Co-existence and Holistic perception of harmony at all levels of existence
- CO5 Apply the principles of Holistic understanding of Harmony in Professional Ethics to improve Competence

Mapping of Course Outcomes with Program Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	1	-	-	1	-	-
CO2	-	-	-	-	-	2	1	-	-	-	-	-
CO3	-	-	-	-	-	2	1	-	-	1	-	-
CO4	-	-	-	-	-	2	1	-	-	1	-	-
CO5	-	-	-	-	-	-	-	2	-	1	-	-

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration—what is it? - Its content and process; Personality Traits- Self Excellence,’Natural Acceptance’ and Experiential Validation- as the process for self-exploration, Adaptability, Belief and Understanding- Self discipline
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
7. Myers-Briggs Type Indicator (MBTI) Personality test

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’

2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)-Habits and Hobbies, SWOT Analysis (Activity)
4. Understanding the characteristics and activities of „I“ and harmony in 'I' – DalaiLamas" Tibetan Personality Test – Dr. Menninger's Psychometric Test.
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal ofPhysical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Health.
7. Epidemiology- Definition of health, Social and Preventive Medicine, Personalhygiene and handling stress, WHO Guidelines

Include practice sessions to discuss the role others have played in making material goodsavailable to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Friends and Foes, Empathy, False Prestige.
4. Concept of an Ideal family- Marriage as an Institution
5. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society, Universal Human Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature and its Equanimity, Respect for all, Nature asTeacher
2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclabilityand self-regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasivespace
4. A Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Vision for the Holistic alternatives, UHVs for entrepreneurship
7. Strategy for transition from the present state to Universal Human Order: (a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
(b) At the level of society: as mutually enriching institutions and organizations – Right understanding and dilemmas of professional ethics in today's world.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions
eg. To discuss the conduct as an engineer or scientist etc.

Text Book

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. Hind Swaraj or 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)
14. Life Skills by KVSG Murali Krishna