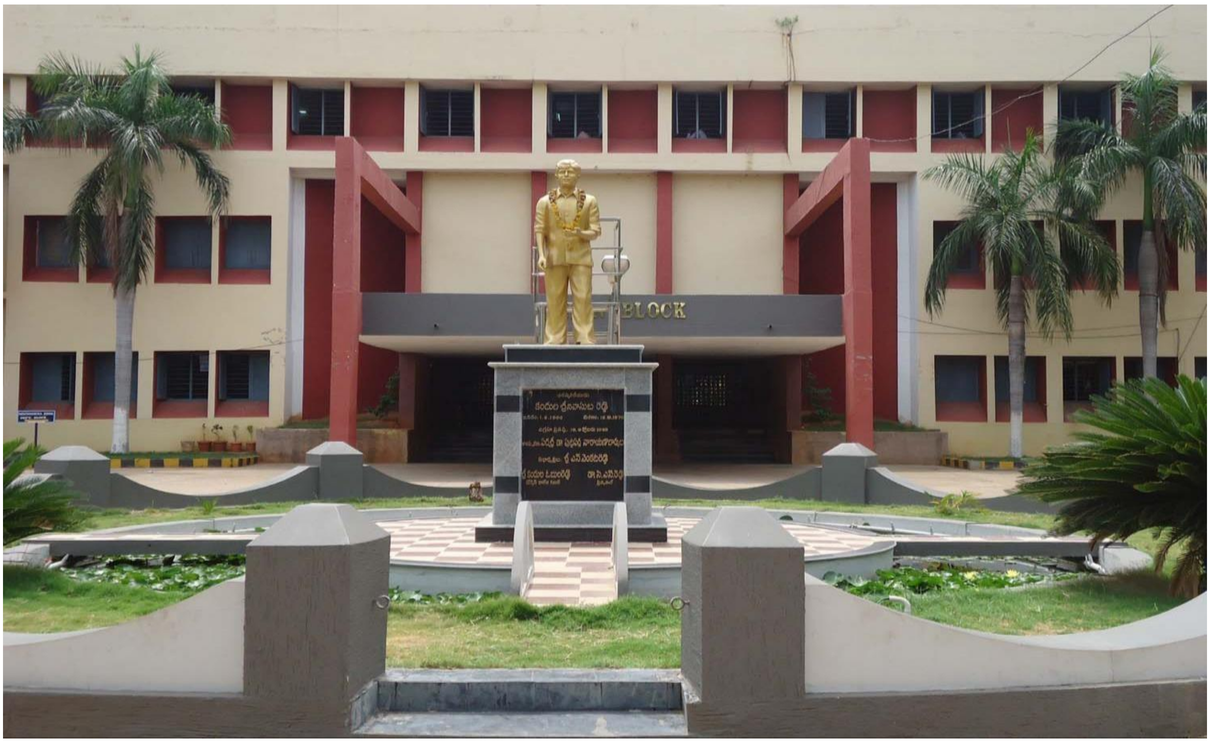
Regulations, Curriculum and Syllabus for

UG Programs in Engineering (R20UG)

(Effective from 2020-21 for Regular students and from 2021-22 for Lateral Entry students)

Computer Science and Engineering



Kandula Srinivasa Reddy Memorial College of Engineering
(Autonomous)
Kadapa 516005, AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC) (An ISO 9001-2008 Certified Institution)

VISION AND MISSION OF THE INSTITUTE

VISION

To evolve as center of repute for providing quality academic programs amalgamated with creative learning and research excellence to produce graduates with leadership qualities, ethical and human values to serve the nation.

MISSION

M1: To provide high quality education with enriched curriculum blended with impactful teaching-learning practices.

M2: To promote research, entrepreneurship and innovation through industry collaborations.

M3: To produce highly competent professional leaders for contributing to Socio-economic development of region and the nation.

VISION AND MISSION OF THE DEPARTMENT

VISION

To evolve as a recognized centre of excellence in the area of Computer Science and Engineering and other related inter-disciplinary fields.

MISSION

M1: To produce competent and industry ready professionals through well balanced curriculum and innovative pedagogy.

M2: To provide conducive environment for research by establishing centre of excellence and industry collaborations.

M3: To instil leadership qualities, ethical values among students through various co-curricular and extracurricular activities.

PROGRAM EDUCATIONAL OBJECTIVES

A graduate of the K.S.R.M.C.E, C.S.E should have a successful career in CSE or a related field, and within three to five years, should

PEO1: To excel in their career as competent software engineer in IT and allied organizations.

PEO2: To pursue higher education and to demonstrate research temper for providing solutions to engineering problems.

PEO3: To contribute for the societal development by exhibiting leadership, through professional, social and ethical values.

PROGRAM OUTCOMES

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - Problem Analysis: Identify, formulate, review 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 system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 - The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9 - Individual and team work: 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 the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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.

PROGRAM SPECIFIC OUTCOMES

PSOs are statements that describe what the graduates of a specific engineering program should be able to do:

PSO1 - Professional Skills: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO2 - Problem-Solving Skills: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3 - Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

KSRM College of Engineering (Autonomous), Kadapa-516005, A.P.

Regulations for UG Programs in Engineering
(R20UG)
(Effective from 2020-21)

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KSRM College of Engineering (Autonomous), Kadapa-516005, A.P.

Regulations for UG Programs in Engineering

(R20 UG) (Effective From 2020-21)

1.0 Nomenclature

1.1 *Academic Year*: Period of academic instruction of, approximately, one year durationthat usually starts in June/July and ends in April/May next

1.2 *Semester*: Either of two divisions of an academic year

1.3 *Major*: A specific field of study. Example: Civil Engineering

1.4 *Minor*: An area outside of, or complementary to, a Major. Example: For CivilEngineering major, Computer Science is a minor and vice versa

1.5 *Subject*: An area of knowledge that is studied as part of a Course

1.6 *Core*: A subject that is mandatory for a Major course of study

1.7 *Elective*: A subject that is selected for study to suit one's individual needs

1.8 *Mandatory Subject*: A subject that is studied to meet certain requirements but has nocredits assigned to it

1.9 *Humanities subjects*: Subjects that describe and interpret human achievements, problems and historical changes at individual and societal levels covering the disciplines of literature, history, and philosophy.

1.10 *Social Sciences*: Subjects that describe the mental and behavioural activities of individuals, groups, organizations, institutions, and nations covering the disciplines of anthropology, economics, linguistics, political science, and psychology

1.11 *Exam*: A test to measure one's progress, knowledge, or ability in a subject

1.12 *Credit*: A numerical weight given to a subject, usually based on quantum of academic work

1.13 *Grade*: A numerical or alphabetic designation measuring the level of achievement in an exam.

1.14 *Attendance*: Physical presence of oneself in a classroom/laboratory for purpose of ascheduled academic instruction

1.15 *Course*: A series of subjects that constitute a Major field of study

1.16 *Branch*: Same as Course

1.17 *Program*: Same as Course

1.18 *Degree*: An academic title conferred to honour distinguished achievement

1.19 *Minor Degree*: An Academic honour conferred on achieving 20 extra credits in one'sminor area of study

1.20 *Honours*: An Academic honour conferred on achieving 20 extra credits in one'smajor area of study.

2.0 Short Title and Application

2.1 These rules and regulations may be called as R20UG and come into force from Academic Year 2020-21 and exists until superseded by new regulations. These rules are applicable for students who join the institute from academic year 2020-21 onwards. Students who have joined in earlier regulations will continue in their respective regulations.

2.2 These rules and regulations are applicable to all under graduate courses in engineering and technology leading to Bachelor's Degree in Technology (B. Tech)

2.3 The Major courses offered, at present, are:

2.3.1 Civil Engineering

2.3.2 Electrical and Electronics Engineering

2.3.3 Mechanical Engineering

2.3.4 Electronics and Communication Engineering

2.3.5 Computer Science and Engineering

2.4 The Institute may offer new Majors in future to which these rules and regulationswill be applicable.

3.0 Suspension and Amendment of Rules

3.1 Academic Council has the authority to suspend a rule temporarily.

3.2 Academic Council has the authority to amend a rule.

3.3 For affirmative action on any suspension or amendment of a rule, an affirmative vote of three-fifths of the members present and voting shall be required in Academic Council.

4.0 Requirements for Admission

4.1 At present, admissions into first-year class of various Majors are governed by Government and the Affiliating University. The eligibility criteria and procedure for admissions are prescribed by Government and Affiliating University.

4.2 A student is not allowed change of Major after admission into first-year.

4.3 A student must fulfil medical standards required for admission.

4.4 The selected students are admitted into first-year class after payment of the prescribed fees.

5.0 Structure of the B. Tech course

5.1 *Duration*: The duration of B. Tech degree course is eight semesters spread over fouracademic years. Semesters are named sequentially from First Semester to Eighth Semester.

5.2 *Working Days*: Calendar for any semester shall be announced at least four weeks before its commencement. Minimum number of working days shall be 90 for any semester.

5.3 *Curriculum*: Each major shall have core, elective and mandatory subjects drawn from six categories of subject areas - i) Basic Sciences (BSC), ii) Humanities and Social Sciences including Management Courses (HSMC), iii) Engineering Science Courses (ESC), iv) Professional Core Course (PCC), v) Professional Elective Course (PEC), and vi) Open Elective Course (OEC). The curriculum for eachbranch shall be approved by its corresponding Board of Studies and Academic Council.

5.4 *Credits*: All subjects that are assessed for marks have credits assigned to them. Thecredits assigned to subjects shall be given in curriculum. The total number of creditsfor entire course is 160 for all branches.

5.5 *Curriculum and Syllabus*: The curriculum and syllabus for first and second semestersis given in Annexure-1 and Annexure-2 respectively.

5.6 *Medium of Instruction*: The medium of instruction, examinations and all other related activities is English.

5.7 *Responsibility and Advising*: It is the responsibility of the student to understand and know the regulations and requirements to earn the degree. Each student admitted into the degree programs is assigned to a Faculty Advisor who assists the student indesigning an effective program of study. Students should consult their Faculty Advisors for selection of electives and for general advice on academic program.

5.8 *Gap-Year*: Outstanding students who wish to pursue entrepreneurship are allowedto take a break of one year at any time after II Year / III Year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. College Academic Council shall evaluate the proposal submitted by the student and decide on permitting the student for availing the gap-year. Gap- year can be availed once in the entire course.

6.0 Registration and Enrolment

6.1 Prior to start of each semester, every student shall register for all the subjects listedin curriculum and additional subjects required for achieving honours/ minor degree. Excepting first semester, the registration for a semester shall be done duringa specified week after end examinations of previous semester. In first semester, theregistration shall be done within six working days from date of joining. Recommendation of Faculty Advisor is needed for registration.

6.2 A student can register utmost 8 theory subjects, including mandatory subjects, in any semester.

6.3 Late registration will be permitted with a fine, decided from time to time, up to sixworking days from the last date specified for registration.

6.4 A student will be eligible for registration for a semester if she or he i) is promoted tothat semester, ii) has cleared all fees to the Institute, library and hostel of previoussemester, and iii) is not disqualified for registration by a disciplinary action.

6.5 A student will be enrolled and allowed to attend the classes on successful registration and payment of necessary fees to Institution, library, and hostel.

6.6 Registration and enrolment will be controlled by the Office of the Controller of Examinations.

7.0 Assessment Procedure – Internal Tests and End Examinations

7.1 Performance of students in all subjects is assessed continuously through assignments, internal assessment tests and an End examination.

7.2 Allocation of internal assessment and End examination marks

7.2.1 For theory subjects, the allocation is 40 marks for internal assessment and60 marks for End examination totalling 100 marks.

7.2.2 For laboratory/drawing/project work subjects, the allocation is 40 marks forinternal assessment and 60 marks for End examination totalling 100 marks.

7.2.3 For seminar/industrial training/internship subjects, the allocation is 100 marks for internal assessment. There is no end examination for these subjects.

7.2.4 For mandatory subjects the allocation is 40 marks for internal assessment and no allocation for End examination. These marks are specified for purpose of clause 9.3, and do not account for any credits.

7.3 Internal Assessment

7.3.1 Internal assessment means performance evaluation of students by faculty members who teach the subjects.

7.3.2 *Guidelines*:

a) *Allocation*: For theory subjects including mandatory subjects the total internal assessment marks is 40 of which 30 marks are assessed through midterm tests, 5 marks by surprise or sudden quiz and 5 marks by assignments. The faculty members of the concerned subject will assess themarks in the midterm tests and assignments.

b) *Midterm tests*: Each midterm test will be of 90 minutes duration and evaluated for 30 marks. Internal assessment marks for midterm tests will be calculated as weighted sum of the two midterm test marks, with 80% weight for the best and 20% weight for the other marks. Internal assessment marks for assignments is calculated as the average of all assignments. Total internal marks are the sum of midterm tests, surprise orsudden quiz and assignments assessment marks.

If any student abstains for any midterm test, she or he will be awarded zeromarks for that midterm test. If any student fails to submit any assignmentwithin the specified deadline, she or he will be awarded zero marks for thatassignment.

i. *Number and duration*: There shall be two midterm tests each with a duration of 90 minutes.
ii. *Format of test and division of marks*: Internal test shall consist of only descriptive part for 30 marks.
iii. *Descriptive or Subjective part*: Subjective part shall contain three questionsand all questions shall be answered. However, each question can have internal choice (either or type question). Generally, each question shall testone Course Outcome (CO).
iv. *Syllabus*: Each test shall cover 50% of the syllabus, approximately.

c) *Assignments*: The assignments shall aid and hone the daily routine of students. Assignments shall be stimulating and thought provoking to the student. Whilesome questions may test student's understanding of the subject, there shall bequestions that imply connect to real world applications. A variety of questionscan posed in assignments.

i. *Number:* A minimum of four assignments shall be given in each subject with one assignment from Unit I to IV of syllabus of that subject.
ii. *Quantum of work*: An assignment shall take about four to six hours of study / work per week. Assignments shall not be overloaded nor under loaded. As a guideline, each assignment may contain five questions, each question taking an hour to answer.
iii. *Marks*: Each assignment must be evaluated for fifty marks. Final marks areobtained by averaging all the assignment marks and reducing it to five marks.
iv. *Deadlines*: Students shall be given at least one-week time to complete and submit assignments. Assignments shall be submitted within deadline. Latesubmissions should be awarded zero marks.
v. *General*: It is advised to administer assignments using Google Classroom.

d) *Quiz*: The concerned faculty has to conduct 8 surprise quiz exams in the regular class itself. From each unit two quiz exams shall be conducted and each quiz is for 10 marks. Out of 8 quizzes 6 best quizzes shall be considered and average of 6 quizzes will be reduced to 5 marks. Each quiz can be fill in the blanks or single sentence answer or definitions.

7.3.3 For laboratory/practical/drawing subjects, the internal assessment will be based on regular laboratory work over full semester. The assessment will bedone by the faculty concerned. The students shall be informed sufficiently early of the procedure to be followed for internal assessment.

7.3.4 For subjects like seminar, project-work, industrial training/internship, andcomprehensive viva-voce, the internal assessment will be done by a Department Committee consisting of two senior faculty members and faculty guide of concerned student. The assessment procedure will be informed sufficiently early to the students.

a) *Mandatory internships*: University Guidelines shall apply.
b) *Evaluation of internships*: Shall be evaluated through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the department committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.
c) *Final Semester Internship*: A student should mandatorily undergo internship (University Guidelines shall apply) and should work parallelly on a project. At the end of the semester the candidate shall submit an internship completion certificate and a project report. The project report shall be evaluated with an external examiner.

7.3.5 After the course work is over, the student is permitted to improve his/her internal marks of any 3 theory subjects in the entire course. However he/she will have to attend the course work.

7.4 End examinations

7.4.1 End examinations shall be conducted after completion of coursework in each semester. End exams assessment is for 60 marks. The question paper contains 5 questions and all questions shall be answered. Each question have internal choice (either or type question). Each question carries 12 marks.

7.4.2 The question papers for theory subjects shall be set by faculty members outside of the Institute. The external faculty members for question paper setting shall be appointed by the Principal.

7.4.3 Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will beevaluated by external examiners.

7.4.4 For laboratory subjects, end examination shall be conducted by a committee consisting of two internal examiners. One examiner shall be appointed by Head of Department of concerned Major, and the other examiner shall be appointed by the Principal.

7.4.5 For project work viva-voce, end examination shall be conducted by a committee consisting of one internal examiner, one external examiner, and the concerned guide of the student. Internal examiner shall be appointed by Head of Department of concerned Major, and the external examiner shall be appointed by the Principal.

7.4.6 If a student abstains from End examination of any subject, for any reason, sheor he shall be marked as "ABSENT" in that subject.

7.4.7 There is no end examination for mandatory subjects.

8.0 Method of Assigning Letter Grades and Grade Points

8.1 For all credit-bearing subjects, performance of a student in a subject is indicated bya letter grade that corresponds to absolute marks earned in that subject. Each lettergrade is assigned a numeric Grade Point that is used to compute Grade Point Average on a scale of 0 to 10.

8.2 Performance of a student in both internal assessment and End examination will beconsidered for awarding grades for credit bearing subjects. Total marks earned in asubject is the sum of marks obtained in internal assessment and End examination in that subject.

8.3 Pass grade S to E is assigned to a subject based on total marks earned in that subject provided that a student earns at least i) 35% of marks in End examination,and ii) 40% of marks in internal assessment and End examination put together; otherwise fail grade F will be assigned to that subject.

8.4 Grade I will be assigned to a subject if a disciplinary action is pending and is not resolved before publication of results. Office of Controller of Examinations shall resolve the pending disciplinary action within six working days from the date of publication of results and change the grade to any of S to F.

8.5 Grade *Ab* will be assigned to a subject if a student abstains for End examination ofthat subject.

8.6 The absolute marks and corresponding letter grade and grade points are given in Table 1.

Table 1: Letter Grades and Grade Points

Absolute Marks	Letter Grade	Grade Points assigned	Remark
$\geq$ 90	S (Outstanding)	10	Pass
80 - 89	A (Excellent)	9	Pass
70 - 79	B (Very Good)	8	Pass
60 - 69	C (Good)	7	Pass

50 - 59	D (Average)	6	Pass
40 - 49	E (Below Average)	5	Pass
< 40	F (Fail)	0	Fail
Absent	Ab (Absent)	0	Fail
-	I	0	Result Withheld

8.7 *SGPA*: Semester Grade Point Average indicates the performance of a student in allcredit-bearing subjects of a semester. SGPA is calculated as the weighted average ofGrade Points of all subjects of the semester with corresponding credits of subjects as weights. Audit and Self-study subjects are not considered for SGPA calculation

$$SGPA = \frac{\sum GP_i \times CR_i}{\sum CR_i}$$

where GP_i = Grade Point earned in a subjectand CR_i = Credits allocated for that subject

8.8 *CGPA*: Cumulative Grade Point Average indicates the performance of a student in all semesters up to and including the current semester under consideration. CGPAis calculated as the weighted average of SGPAs with total credits in each semester as the weights.

$$CGPA = \frac{\sum S_i \; X \; TC_i}{\sum TC_i}$$

where S_i = SGPA obtained in a semesterand TC_i = Total Credits for that semester

8.9 As per AICTE regulations, conversion of CGPA into equivalent percentage is asfollows:

Equivalent Percentage = (CGPA – 0.50) □ 10

8.10 In *SGPA / CGPA* calculations credits earned towards honours / minor degree will not be counted.

8.11 *Grade Card*: All students shall be issued Grade Cards after the publication of results of a semester. Grade Card is a statement of performance of a student in a semester. It contains information about each registered subject: type of subject, allocated credits, and letter grade earned. SGPA and CGPA will also be indicated.

9.0 Requirements for Completing Subjects

9.1 A student shall complete all credit-bearing and mandatory subjects successfully tobe eligible for award of degree.

9.2 *Credit-bearing subjects*: A student is considered to have completed a credit-bearing subject successfully and earned credits if she or he obtains a pass grade from S to Ein that subject. If a student receives fail grade F or *Ab* in any subject, she or he mustregister for supplementary End examination for that subject as and when opportunity arises and improve grade to pass grade.

9.3 *Mandatory subjects*: A student is considered to have successfully completed a mandatory subject if she or he earns at least 40% of internal assessment marks in that subject.

9.4 *Supplementary exam for mandatory subjects*: If a student fails in mandatory subject, she or he shall register for supplementary examination in that subject as and when theopportunity arises and pass that subject. The supplementary exam will be conducted for 30 marks covering the entire syllabus and student is deemed to havepassed in the subject if she or he earns 12 marks (40% marks) in the supplementaryexam, disregard of her or his performance in assignments and internal tests.

10.0 Requirements for taking End Examinations and Promotion

10.1 A student is eligible to take regular End Examinations of current semester if she orhe fulfils the attendance requirement.

10.2 A student shall be promoted from current semester to succeeding semester onsatisfying the attendance and total credits-earned requirements.

10.3 Attendance Requirement

10.3.1 Attendance of students shall be recorded for credit-bearing and mandatory subjects as per the work load indicated in curriculum.

10.3.2 Total class-periods conducted shall be reckoned from beginning to end of asemester as published in academic calendar.

10.3.3 Aggregate Percentage of Attendance is calculated using total number of class-periods attended as numerator and total number of class-periodsconducted for the concerned semester as the denominator.

10.3.4 A minimum aggregate attendance of 75% is required for promotion to succeeding semester and be eligible to take End examinations of current semester. In addition, student has to acquire a minimum of 40% attendancein each subject.

10.3.5 A student can appeal to the Principal for condoning deficiency in aggregate attendance if she or he gets an aggregate attendance of 65% or more but lessthan the required 75%, presenting a valid reason for deficiency. Such a student will be granted promotion if the Principal pardons the deficiency. Principal has the right to reject the appeal if he/she is not satisfied with theperformance of the student or the reason cited for deficiency of the attendance.

10.3.6 A student earning less than 65% aggregate attendance will be denied promotion. A student who is not promoted on basis of attendance shall be removed from the rolls and shall register for the same semester when opportunity arises. The current semester record of the student is cancelled automatically.

10.4 Credits-Earned Requirement

10.4.1 This rule is applicable for promotion of a student from fourth semester to fifth semester and from sixth semester to seventh semester.

10.4.2 A student who is denied promotion for want of requisite credits shall take supplementary examinations, as and when offered, and earn credits to be eligible for promotion.

10.4.3 Subjects registered for honours/minor degree shall not be considered towards credits-earned requirement.

10.4.4 For promotion from fourth semester to fifth semester, a student must earn atleast 40% credits (rounded to lower integer) from first semester to third semester subjects. A student will get the following opportunities to pass the subjects:

First semester subjects : One regular and three supplementary exams

Second semester subjects : One regular and two supplementary exams

Third semester subjects : One regular and one supplementary exam

10.4.5 For promotion from sixth semester to seventh semester, a student must earn at least 40% credits (rounded to lower integer) from first semester to fifth semester subjects. A student will get the following opportunities to pass the subjects:

First semester subjects : One regular and five supplementary exams

Second semester subjects : One regular and four supplementary exams

Third semester subjects : One regular and three supplementary exams

Fourth semester subjects : One regular and two supplementary exams

Fifth semester subjects : One regular and one supplementary exam

11.0 Revaluation of End Examination Scripts

11.1 Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee.

11.2 Procedure for Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination marks will be awarded for that subject.

11.3 A student can apply for revaluation in a subject only once.

12.0 Supplementary End Examinations

12.1 Students are eligible to take Supplementary examinations in subjects with fail gradeeither F or *Ab* only.

12.2 Supplementary examinations for even semester subjects will be conducted along with regular examinations of odd semester subjects.

12.3 Supplementary examinations for odd semester subjects will be conducted along with regular examinations of even semester subjects.

12.4 For eighth semester, special supplementary examinations will be conducted in second week following the results publication date of regular examination of eighthsemester.

13.0 Requirements for Award of B. Tech degree

13.1 Time Limit for completion of requirements for award of degree is eight academic years including gap-year from the date of admission. A student who could not complete all the requirements in this time limit shall forego admission and will beremoved from the rolls of the Institute.

13.2 A student shall be eligible for award of B. Tech degree provided she or he has:

13.2.1 Registered and successfully completed all required credit-bearing and mandatory subjects with a total of 160 credits

13.2.2 Secured a CGPA of 4.5 or more

13.2.3 Cleared all dues to the Institute, library and hostel

13.2.4 No disciplinary action is pending against her or him

13.2.5 Satisfied any other stipulation of the affiliating university.

13.3 *Award of Class*: Each student will be given class in degree based on CGPA asfollows:

Table 2: Class of Degree

Class of Degree	Range of CGPA
Pass Class	>= 4.5 but <5.5
Second Class	>= 5.5 but <6.5
First Class	>= 6.5 but <7.5
First Class with Distinction	>= 7.5

13.4 *Degree with Honours designation*: Students with higher learning capabilities are encouraged to opt for Honours designation. Degree with Honours imply a higher level of academic achievement. A student can earn B.Tech degree with honours designation by meeting the following requirements

13.4.1 Honours designation is optional. A student can opt for either Honours designation or Minor degree (clause 13.5) but not both.

13.4.2 *Entry eligibility*: Students shall apply for Honours designation at the beginning of the fourth semester. Eligibility criteria are (i) minimum CGPA of 8.0 and (ii) no backlogs, reckoned up to second semester. The Chairperson of the concerned Board of Studies will process the applications and publish the list of eligible students.

13.4.3 *Additional course work*: Students shall complete an additional 20-credits coursework, in addition to 160 regular credits, in her/his own major during fifth to seventh semesters. The Board of Studies (BoS) of the concerned major shall specify the list of advanced elective subjects for the purpose of honours designation.

Out of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through twoMOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the BoS.

If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by theconcerned Head of the department in consultation with BoS.

If a student drops or is terminated from the Honours program, the additional credits earned so far will remain extra. These additional courses will find mention in the transcript but not in the degree certificate.

13.4.4 *Registration and enrollment*: Clause 6.0 shall apply

13.4.5 *Evaluation*: The evaluation shall be as per clause 7.0

13.4.6 *Continuous performance*: Students shall earn a minimum SGPA of 8.0 in allsemesters, from fourth to seventh, and without backlogs to be eligible for award of Honours designation. Regular and additional subjects shall be considered for SGPA calculation. If a student does not get a minimum SGPA of 8.0 or fails in any subject during fourth to seventh semesters, she/he will lose candidature for honours designation.

13.5 *Minor Degree designation*: Students with higher learning capabilities are encouraged to opt for Minor degree designation. Minor degree imply a higher level of academic achievement and improves employability. A student can earn minor degree designation by meeting the following requirements.

13.5.1 Minor degree is optional. A student can opt for either Minor degree or Honours designation (clause 13.4) but not both.

13.5.2 *Entry eligibility*: Students shall apply for minor degree at the beginning of fourth semester. Eligibility criteria are (i) minimum CGPA of 8.0 and (ii) no backlogs, reckoned up to second semester.

The Chairperson of the concerned Board of Studies (minor department) will process the applications and publish the list of eligible students.

13.5.3 *Additional coursework*: Students shall complete an additional 20-credits coursework, in addition to 160 regular credits, in selected minor program during fourth to seventh semesters. The Board of Studies (BoS) of the concerned minor program shall specify the list of core and elective subjectsfor the purpose of minor degree. Out of the 20 credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS and must pursue atleast 2 courses through MOOCs.

13.5.4 *Registration and enrollment*: Clause 6.0 shall apply.

13.5.5 *Evaluation*: The evaluation shall be as per clause 7.0.

13.5.6 *Continuous performance*: Students shall earn a minimum SGPA of 8.0 in allsemesters, from fourth to seventh, and without backlogs to be eligible for award of minor degree. Regular and additional subjects shall be consideredfor SGPA calculation. If a student does not get a minimum SGPA of 8.0 orfails in any subject during fourth to seventh semesters, she/he will lose candidature for minor degree.

13.6 Degree will be issued under the seal of affiliating University.

14.0 Regulations for Lateral Entry Students under R20 UG

Title and application: These rules and regulations may be called R20UG-LE and come into force from academic year 2021-22 and exist in force until superseded by other regulations. These regulations are applicable to students admitted under lateral entry scheme leading to Bachelor’s Degree in Technology (B.Tech).

a) *Regulations and curriculum*: The regulations and curriculum of R20UG shall be applicable in general with the following modifications:

   i. *Entry and duration*: The students will be admitted directly into third semester ofregular 4-year B.Tech degree course governed by R20UG regulations. The duration of the course is three academic years.

   ii. *Curriculum*: Third semester to eighth semester curriculum of R20UG.

   iii. *Promotion by credits-earned requirement*: This is applicable for the promotion of a student from sixth semester to seventh semester only. She/he must earn at least 40% of total credits (rounded to lower integer) from third to fifth semesters for promotion from sixth semester to seventh semester.

b) Requirements for the award of B.Tech degree:

   i. Time limit for completion of requirements for award of degree is six academicyears from the date of admission.

   ii. Registered and successfully completed all required credit-bearing and mandatory subjects with a total of 121 credits. (third semester to eighth semester subjects)

   iii. *Honours/minors designation*: shall earn extra 20 credits in addition to 121 credits.

15.0 Transitory Regulations

15.1 A student who initially joins the Institute in a previous Regulation and has to re- join in a semester of the present Regulations, due to any reason, shall be bound by the rules of the current Regulations. Board of Studies of the concerned Major will specify, extra or otherwise, academic coursework to be undertaken by such students who join the current Regulations.

COMPUTER SCIENCE AND ENGINEERING

Course Structure

I Semester

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2021101	Linear Algebra and Calculus	BSC	3	0	0	40	60	3
2	2023102	Chemistry	BSC	3	0	0	40	60	3
3	2005103	C-Programming & Data Structure	ESC	3	0	0	40	60	3
4	2014104	Basic Electrical & Electronics Engineering	ESC	3	0	0	40	60	3
5	20EW105	Engineering Workshop	ESC	0	0	3	40	60	1.5
6	2005106	IT Workshop	ESC	0	0	3	40	60	1.5
7	2023107	Chemistry Lab	BSC	0	0	3	40	60	1.5
8	2005108	C-Programming & Data Structures Lab	ESC	0	0	3	40	60	1.5
9	2014109	Basic Electrical & Electronics Engineering Lab	ESC	0	0	3	40	60	1.5
Total				**12**	**00**	**15**	**360**	**540**	**19.5**

II Semester

S.No	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2021201	Differential Equations & Vector Calculus	BSC	3	0	0	40	60	3
2	20AP202	Applied Physics	BSC	3	0	0	40	60	3
3	2024203	Communicative English	HSMC	3	0	0	40	60	3
4	2005204	Python Programming	ESC	3	0	0	40	60	3
5	2003205	Engineering Drawing	ESC	1	0	2	40	60	2
6	2003206	Engineering Drawing Lab	ESC	0	0	2	40	60	1
7	20AP207	Applied Physics Lab	BSC	0	0	3	40	60	1.5
8	2024208	Communicative English Lab	HSMC	0	0	3	40	60	1.5
9	2005209	Python Programming Lab	ESC	0	0	3	40	60	1.5
10	20MC210	Environmental Science	MC	3	0	0	40	00	0.0
Total				**16**	**00**	**13**	**390**	**540**	**19.5**

III Semester

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2024301	Business Economics and Accounting for Engineers	HSMC	3	0	0	40	60	3
2	2005302	Advanced Data Structures	PCC	3	0	0	40	60	3
3	2005303	Formal Languages & Automata Theory	PCC	3	0	0	40	60	3
4	2005304	Object Oriented Programming through JAVA	PCC	3	0	0	40	60	3
5	2005305	Data Base Management Systems	PCC	3	0	0	40	60	3
6	2005306	Advanced Data Structures Lab	PCC	0	0	3	40	60	1.5
7	2005307	JAVA Lab	PCC	0	0	3	40	60	1.5
8	2005308	Data Base Management Systems Lab	PCC	0	0	3	40	60	1.5
9	2005309	**Skill Oriented Course** Exploring Data Analysis with R/ NASSCOM Courses	SC	0	0	4	40	60	2.0
Total				**15**	**00**	**13**	**400**	**540**	**21.5**

IV Semester

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2005401	Principles of Operating Systems	PCC	3	0	0	40	60	3
2	2005402	Computer Organization	PCC	3	0	0	40	60	3
3	2004403	Microprocessors & Microcontrollers	ESC	3	0	0	40	60	3
4	2005404	Digital Logic Circuits & Design	PCC	3	0	0	40	60	3
5	2021405	Probability Theory & Statistical Methods	BSC	3	0	0	40	60	3
6	2014406	Microprocessors & Microcontrollers Lab	ESC	0	0	3	40	60	1.5
7	2005407	Principles of Operating Systems Lab	PCC	0	0	3	40	60	1.5
8	2005408	Digital Logic Design Lab	PCC	0	0	3	40	60	1.5
9	2005409	**Skill Oriented Course** Advanced Python Programming/ NASSCOM Courses	SC	0	0	4	40	60	2.0
10	2024410	Universal Human Values	HSMC	3	0	0	40	60	3.0
Total				**18**	**00**	**13**	**400**	**600**	**24.5**

V Semester

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2005501	Software Engineering	PCC	3	0	0	40	60	3
2	2005502	Design and Analysis of Algorithms	PCC	3	0	0	40	60	3
3	2005503	Computer Networks	PCC	3	0	0	40	60	3
4	**Open Elective-1**								
	Courses offered by: **Civil engineering**								
	20CE101	Disaster management	OEC-1	3	0	0	40	60	3
	20CE102	Basics of Civil Engineering	OEC-1	3	0	0	40	60	3
	20CE103	Building Materials	OEC-1	3	0	0	40	60	3
	Courses offered by: **Electrical and Electronics Engineering**								
	20OE201	Modern Control Theory	OEC-1	3	0	0	40	60	3
	20OE202	Programming Fundamentals for Numerical Computations	OEC-1	3	0	0	40	60	3
	Courses offered by: **Mechanical Engineering**								
	20OE301	Introduction to Hybrid and Electric Vehicles	OEC-1	3	0	0	40	60	3
	20OE302	Rapid Prototyping	OEC-1	3	0	0	40	60	3
	20OE303	Design for Manufacturing and Assembly	OEC-1	3	0	0	40	60	3
	20OE304	Energy Systems Engineering	OEC-1	3	0	0	40	60	3
	20OE305	Smart Materials	OEC-1	3	0	0	40	60	3
	Courses offered by: **Electronics and Communication Engineering**								
	20OE401	Overview of Microcontrollers	OEC-1	3	0	0	40	60	3
	20OE402	Industrial electronics	OEC-1	3	0	0	40	60	3
	Courses offered by: **Artificial Intelligence and Machine Learning**								
	20OE3901	Data Structures	OEC-1	3	0	0	40	60	03
	20OE3902	OOP through C++	OEC-1	3	0	0	40	60	03
	Courses offered by: **Humanities and Sciences**								
	20OE601	Employability Skills	OEC-1	3	0	0	40	60	03
	20OE602	Advanced Numerical Methods	OEC-1	3	0	0	40	60	03
	20OE604	Basics of Nanotechnology	OEC-1	3	0	0	40	60	03
	20OE605	Write it Right	OEC-1	3	0	0	40	60	03
	20OE606	Human Capital Management	OEC-1	3	0	0	40	60	03
	20OE607	Engineering Materials	OEC-1	3	0	0	40	60	03
5	**Professional Elective Course –I (PEC-I)**								
	2005504	Web Technologies	PEC	3	0	0	40	60	3
	2005505	Multimedia Systems	PEC	3	0	0	40	60	3
	2005506	Distributed Systems	PEC	3	0	0	40	60	3
6	2005507	DAA Lab	PCC	0	0	3	40	60	1.5
7	2005508	Professional Elective Course -I Lab	PCC	0	0	3	40	60	1.5

8	20245SC	**Soft Skill Oriented Course** Advanced English & Communication Lab / Professional Communication Lab	SC	0	0	4	40	60	2.0
9	2005510	Community Service Project	PROJ	0	0	0	100		1.5
10	20MC509	Constitution of India	MC	2	0	0	40	00	00
Total				**17**	**00**	**10**	**420**	**480**	**21.5**

VI Semester

S. No.	SubjectCode	SUBJECT	SC	L	T	P	IM	EM	CR
1	2005601	Internet of Things	PCC	3	0	0	40	60	3
2	2005602	Data Mining	PCC	3	0	0	40	60	3
3	2005603	Cryptography & Network Security	PCC	3	0	0	40	60	3
4	**Open Elective-2**								
	Courses offered by: **Civil Engineering**								
	20CE104	Solid Waste Management	OEC-2	3	0	0	40	60	3
	20CE105	Estimation and Costing	OEC-2	3	0	0	40	60	3
	20CE106	Water management	OEC-2	3	0	0	40	60	3
	Courses offered by: **Electrical and Electronics Engineering**								
	20OE203	Energy Conversion Systems	OEC-2	3	0	0	40	60	3
	20OE204	Smart grid	OEC-2	3	0	0	40	60	3
	Courses offered by: **Mechanical Engineering**								
	20OE306	Automotive Electronics, Sensors & Drives	OEC-2	3	0	0	40	60	3
	20OE307	Robotics and Applications in Manufacturing	OEC-2	3	0	0	40	60	3
	20OE308	Sensors in Intelligent Manufacturing	OEC-2	3	0	0	40	60	3
	20OE309	Non-Conventional Sources of Energy	OEC-2	3	0	0	40	60	3
	20OE310	Supply Chain Management	OEC-2	3	0	0	40	60	3
	Courses offered by: **Electronics and Communication Engineering**								
	20OE403	Introduction to VLSI	OEC-2	3	0	0	40	60	3
	20OE404	Principles of Communication	OEC-2	3	0	0	40	60	3
	Courses offered by: **Artificial Intelligence and Machine Learning**								
	20OE3903	Operating Systems	OEC	3	0	0	40	60	03
	20OE3904	Data Base Management Systems	OEC	3	0	0	40	60	03
	Courses offered by: **Humanities and Sciences**								

	20OE603	Mathematical Statistics for Data Science and Data Analytics	OEC	3	0	0	40	60	03
	20OE608	Basics of Electrical, Magnetic and Optoelectronic materials	OEC	3	0	0	40	60	03
	20OE609	Corrosion & Control	OEC	3	0	0	40	60	03
	20OE615	Academic Writing	OEC	3	0	0	40	60	03
	20OE611	Basics Financial Management for Engineers	OEC	3	0	0	40	60	03
5	**Professional Elective Course –II (PEC-II)**								
	2005604	Artificial Intelligence	PEC	3	0	0	40	60	3
	2005605	Software Testing	PEC	3	0	0	40	60	3
	2005606	Adhoc & Sensor Networks	PEC	3	0	0	40	60	3
6	2005607	IOT Lab	PCC	0	0	3	40	60	1.5
7	2005608	Data Mining Lab	PCC	0	0	3	40	60	1.5
8	2005609	Network Security Lab	PCC	0	0	3	40	60	1.5
9	2005610	**Skill Oriented Course** Mobile Application Development/ NASSCOM Courses	SC	0	0	4	40	60	2.0
10	20MC612	Management Organizational Behavior	MC	2	0	0	40	00	00
Total				**17**	**00**	**13**	**440**	**540**	**21.5**

VII Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1		**Professional Elective Course-III (PEC-III)**							
	2005701	Compiler Design	PEC	3	0	0	40	60	3
	2005702	Computer Graphics	PEC	3	0	0	40	60	3
	2005703	Cyber Security	PEC	3	0	0	40	60	3
2		**Professional Elective Course-IV (PEC-IV)**							
	2005704	Machine Learning	PEC	3	0	0	40	60	3
	2005705	Object Oriented Analysis & Design	PEC	3	0	0	40	60	3
	2005706	Natural Language Processing	PEC	3	0	0	40	60	3
3		**Professional Elective Course-V (PEC-V)**							
	2005707	Cloud Computing	PEC	3	0	0	40	60	3
	2005708	Deep Learning	PEC	3	0	0	40	60	3
	2005709	Computer Vision	PEC	3	0	0	40	60	3
4	**Open Elective-3**								
	Courses offered by: **Civil Engineering**								

	20CE107	Repair and rehabilitation of structures	OEC-3	3	0	0	40	60	3
	20CE108	Geo-environmental engineering	OEC-3	3	0	0	40	60	3
	20CE109	Environmental impact assessment	OEC-3	3	0	0	40	60	3
	Courses offered by: **Mechanical Engineering**								
	20OE311	Entrepreneurship	OEC-3	3	0	0	40	60	3
	20OE312	Solar Energy Systems	OEC-3	3	0	0	40	60	3
	20OE313	Internal Combustion Engine	OEC-3	3	0	0	40	60	3
	Courses offered by: **Electrical and Electronics Engineering**								
	20OE205	Intelligent Control Techniques	OEC-3	3	0	0	40	60	3
	20OE206	Electrical System Estimation & Costing	OEC-3	3	0	0	40	60	3
	Courses offered by: **Electronics and Communication Engineering**								
	20OE405	Electronic Instrumentation and measurements	OEC-3	3	0	0	40	60	3
	20OE406	Introduction to IOT	OEC-3	3	0	0	40	60	3
	20OE407	Nano Electronics	OEC-3	3	0	0	40	60	3
	Courses offered by: **Artificial Intelligence and Machine Learning**								
	20OE3905	Cyber Security	OEC-3	3	0	0	40	60	03
	20OE3906	Java Programming	OEC-3	3	0	0	40	60	03
	Courses offered by: **Humanities and Sciences**								
	20OE612	Transforms and Its Applications	OEC-3	3	0	0	40	60	3
	20OE613	Physics of Renewable Energy	OEC-3	3	0	0	40	60	3
	20OE614	Fuel Technology	OEC-3	3	0	0	40	60	3
	20OE615	Professional Communication	OEC-3	3	0	0	40	60	3
	20OE616	Digital and Social Media Management	OEC-3	3	0	0	40	60	3
5	**Open Elective -4**								
	Courses offered by: **Civil Engineering**								
	20OE110	Industrial safety engineering	OEC-4	3	0	0	40	60	3
	20OE111	Surveying	OEC-4	3	0	0	40	60	3
	20OE112	Traffic Engineering	OEC-4	3	0	0	40	60	3
	Courses offered by: **Mechanical Engineering**								
	20OE314	Energy Auditing	OEC-4	3	0	0	40	60	3
	20OE315	Sustainable Engineering	OEC-4	3	0	0	40	60	3
	20OE316	Industrial Engineering & Management	OEC-4	3	0	0	40	60	3
	Courses offered by: **Electrical and Electronics Engineering**								
	20OE207	Basic Power Electronics	OEC-4	3	0	0	40	60	3
	20OE208	System Reliability Concepts	OEC-4	3	0	0	40	60	3

	Courses offered by: **Electronics and Communication Engineering**								
	20OE408	Fundamentals of RADAR Engineering.	OEC-4	3	0	0	40	60	3
	20OE409	Biomedical Instrumentation	OEC-4	3	0	0	40	60	3
	20OE410	Digital Circuits	OEC-4	3	0	0	40	60	3
	Courses offered by: **Artificial Intelligence and Machine Learning**								
	20OE3907	Data Analytics with Python	OEC-4	3	0	0	40	60	3
	20OE3908	Web Designing using PHP	OEC-4	3	0	0	40	60	3
	Courses offered by: **Humanities and Sciences**								
	20OE617	Operations Research	OEC-4	3	0	0	40	60	3
	20OE618	Fundamentals of Quantum Computation and Nano photonics	OEC-4	3	0	0	40	60	3
	20OE619	Green Chemistry & Technology	OEC-4	3	0	0	40	60	3
	20OE620	Creative Writing	OEC-4	3	0	0	40	60	3
	20OE621	Materials Management	OEC-4	3	0	0	40	60	3
6	**Humanities & Social Science Elective**								
	2006701	Human Resource Development	HSMC	3	0	0	40	60	3
	2006702	Digital Marketing	HSMC	3	0	0	40	60	3
	2006703	Project Management	HSMC	3	0	0	40	60	3
7	2005710	Big Data Technologies/ NASSCOM Courses	SEC	0	0	4	40	60	2
8	2005711	Internship	INT	0	0	0	100	0	3
Total				**18**	**00**	**4**	**380**	**420**	**23**

VIII Semester

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2005801	Major Project/ Internship (6Months)	PROJ	-	-	-	40	60	12
Total									**12**

B.Tech I SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="5">Linear Algebra & Calculus</td><td colspan="3">B.Tech CSE I Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2021101</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● This course will illuminate the students in the concepts of calculus and linear algebra.
● To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Develop the use of matrix algebra techniques that is needed by engineers for pract applications</td></tr>
<tr><td>CO 2</td><td colspan="8">Utilize mean value theorems to real life problems</td></tr>
<tr><td>CO 3</td><td colspan="8">Classify the functions of several variables which is useful in optimization techniques.</td></tr>
<tr><td>CO 4</td><td colspan="8">Evaluate multiple integrals.</td></tr>
<tr><td>CO 5</td><td colspan="8">Define Beta and Gamma functions.</td></tr>
</table>

Bridge Course: Limits, continuity, Types of matrices

UNIT -I

Rank of a matrix by Echelon form, Normal form. Solving system of homogeneous and non-homogeneous linear equations. Eigen values and Eigen vectors for real matrices – Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley–Hamilton theorem. Diagonalisation by orthogonal transformation.

UNIT -II

Mean Value Theorems: (08 Hours)

Rolle’s theorem, Lagrange’s mean value theorem, Cauchy’s mean value theorem, Taylor’s and Maclaurin’s theorems with remainders (without proof), related problems.

UNIT -III

Multivariable Calculus: (10 Hours)

Partial derivatives, total derivative, chain rule, change of variables, Jacobians, Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

UNIT -IV

Multiple Integrals: **(10 Hours)**

Evaluation of double integrals in Cartesian coordinates and polar coordinates – Change of variables in double integrals – Change the order of integration in double integrals – Evaluation of triple integrals in Cartesian and polar coordinates – Change of variables between Cartesian, cylindrical and spherical polar coordinates.

UNIT -V

Beta and Gamma functions: **(08 Hours)**

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of definite integrals using Beta and Gamma functions.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013.
3. Introductory Linear Algebra with applications, Kolman, Bernard Hill, David R
4. Linear Algebra, Hoffman Kennethkunze Ray

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. Linear Algebra: A Modern Introduction, D Poole, 2nd Edition, Brooks/Cole, 2005.
3. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.
4. Linear Algebra and its applications, Gilbert Strang.

Course Title	Chemistry					B.Tech CSE I Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2023102	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers.
- To introduce instrumental methods, molecular machines and switches

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic quantum approach of Molecular orbital theory and calculation of bond order
CO 2	Remember the principle of Band diagrams in application of conductors and semiconductors.
CO 3	Compare the materials of construction for battery and electrochemical sensors.
CO 4	Explain the preparation, properties, and applications of thermoplastics & thermosetting, Elastomers & con ducting polymers
CO 5	Analyze the principles of spectroscopy and different application of analytical instruments.

UNIT I

Structure and Bonding Models:

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 , NO and CO, etc., calculation of bond order.

UNIT II

Modern Engineering materials:

i).Understanding of materials: Crystal field theory – salient features – splitting in octahedral, tetrahedral and square planar geometry. Properties of coordination compounds-Oxidation state, coordination, magnetic properties and colour.

ii). Semiconductor materials, super conductors- basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.

iii). Nanochemistry: Introduction, classification of nanometerials, properties and applications of Fullerenes, carbonnano tubes and Graphines nanoparticles.

UNIT III

Electrochemistry and Applications:

Introduction to Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid- base titrations), pH metric concepts.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen- oxygen, methanol fuel cells – working of the cells.

UNIT IV

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.

Plastics - Thermoplastics and Thermo settings, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylenes,– mechanism of conduction and applications.

UNIT V

Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Regions of Electromagnetic radiation. UV-Visible**,** IR Spectroscopes'- (selection rules, principles and applications). Solid-Liquid Chromatography–TLC, retardation factor.

Text Books:

1. A textbook of Engineering chemistry by Shashi Chawla, Dhanpat Rai & Co publications
2. Atkins' Physical Chemistry, Peter Atkins, Julio de Paula and James Keeler, Oxford University Press, 2010.
3. Textbook of Polymer Science, Third Edition, Fred W. Billi Meyer, TR, A Wiley-Inter Science Publications
4. An Introduction to Electrochemistry, Glasstone, Arihant Publications.

Reference Books:

1. Textbook of Engineering Chemistry, Jain and Jain, Dhanpat Rai & Co publications, 2013
2. New Concise Inorganic Chemistry, 5^{th} Edition, J. D. Lee, Oxford University Press, 2008.
3. Principles of Instrumental Analysis, 6^{th} edition, Douglas A. Skoog, Cengage Publications.
4. Advanced Inorganic Chemistry, Cotton F Albert, Wilkinson Geoffrey, Prism Publications

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<table>
<tr><td>Course Title</td><td colspan="5">C Programming & Data Structures</td><td colspan="3">B.Tech I Sem (CSE, EEE, ME) (R20)
B.Tech II Sem (CE, ECE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005103
(I Sem)
2005203
(II Sem)</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● The course aims to provide exposure to problem-solving through programming
● It aims to train the student to the basic concepts of the C programming language
● Gain knowledge of data structures and their applications</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Formulate simple algorithms for arithmetic and logical problems and to translate algorithms to programs (in C Language).</td></tr>
<tr><td>CO 2</td><td colspan="8">Choose the loops and decision-making statements and arrays to solve the complex problems.</td></tr>
<tr><td>CO 3</td><td colspan="8">Use functions, structures, unions and pointers to solve the given complex problems.</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze and develop stack, queue and various sorting techniques for social relevant examples.</td></tr>
<tr><td>CO 5</td><td colspan="8">Develop linked list and trees for real time problems.</td></tr>
</table>

UNIT I

Introduction to C programming: - C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements. **Jumping statements:** break, continue and goto statements.

UNIT II

Arrays: Introduction, Declaration and initialization of 1D and 2D arrays, **Functions:** types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern. **Strings:** string handling functions, and Command line arguments.

UNIT III

Pointers: Introduction to pointers, declaring and initialization of pointer variable, accessing the address of variables, accessing a variable through its pointer, chain of pointers. **Structures and unions:** Introduction, defining a structure, declaring structure variable, structure initialization, accessing members of structure, copying and comparing structure variables, structures within structures, array of structures, and introduction of union.

UNIT IV

Data Structures: Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

Searching and sorting: linear search, binary search, bubble (exchange) sort, selection sort, insertion sort.

UNIT V

Linked Lists – Single linked list, Operations on Single Linked List: insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations. **Trees** - Tree terminology, representation, Binary trees, representation, binary tree traversals. Binary tree operations.

Text Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.

2. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education

3. Rema Theraja, Programming in C, second edition,Oxford.

4. E. Balagurusamy, C Programming and Data structures,Fourth Edition, McGrawHill.

Reference books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer,Pearson.
3. YashavantKanetkar, Let us C, 15^{th} edition, BPBPublications.
4. Dr. P. ChennaReddy, Computer Fundamentals and C Programming, Second Edition.

<table>
<tr><td>Course Title</td><td colspan="5">Basic Electrical & Electronics Engineering
Part ‘A’: Basic Electrical Engineering
Part ‘B’: Electronics Engineering</td><td colspan="3">B.Tech CSE I Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2014104</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
The objective of the course is to learn basics of DC and AC circuits, Electrical Machines, Transformers and Power Systems. Theory, construction, and operation of electronic devices, biasing of BJTs and FETs, design and construction of amplifiers, concepts & principles of logic devices.</td></tr>
</table>

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the basic fundamentals of DC & AC circuits, network reduction techniq machines and power system fundamentals
CO 2	Understand theory, construction, and operation of electronic devices, working of diodes and its applications, working of transistors, microcontrollers & their applications.
CO 3	Determine the currents, voltages using mesh and nodal analysis, Average and RMS values for different waveforms, equivalent circuit parameters using OC & SC test of single phase transformer.
CO 4	Obtain the EMF equation and characteristics of dc machines and Induction motor.
CO 5	Analyze small signal amplifier circuits to find the amplifier parameters
CO 6	Design small signal amplifiers using proper biasing circuits to fix up proper Q point

Part A: Basic Electrical Engineering

UNIT-I

DC Circuits: Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem. Simple Numerical Problems.

AC Circuits: Representation of sinusoidal waveforms – Average and RMS values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits, simple numerical problems.

UNIT-II

DC Machines: Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Torque equation – Performance Characteristics of DC Motor, speed control (Flux & Armature control of shunt motor), Simple numerical problems.

Transformers: Principle and operation of Single Phase Transformer – Emf equation, equivalent circuit, OC and SC tests on transformer, simple numerical problems.

Induction Motor: Principle and operation of 3-phase Induction Motor [Elementary treatment only].

UNIT-III

Basics of Power Systems: Typical AC power supply scheme – Generation of 3-phase supply, Definition of short, medium and long transmission lines – Concepts of AC & DC distribution system.

Text Books:

1. V.K. Mehta & Rohit Mehta, “Principles of Power System” – S.Chand – 2018.
2. E. Hughes - “Electrical and Electronics Technology” - Pearson - 2010.
3. C.L. Wadhwa – “Generation Distribution and Utilization of Electrical Energy”, 3rd Edition, New Age International Publications.
4. D. P. Kothari and I. J. Nagrath - “Basic Electrical Engineering” - Tata McGraw Hill - 2010.

References:

1. Fundamentals of Electrical Engineering-I, Don Johnson, University Press.
2. Basic Electrical Engineering, SK. Sahdev, Pearson.
3. Basic Electrical Engineering, Abhijith Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, Tata McGraw Hill.
4. Basic Concepts of Electrical Engineering, Kuldeep Sahay, Shivendra Pathak, New Age International Publishers.

Part ‘B’- Electronics Engineering

UNIT-I

Diodes and Applications: Semiconductor Diode, Diode as a Switch& Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Operation and Applications of Zener Diode, LED, Photo Diode.

Transistor Characteristics: Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Biasing of Transistor Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Concepts of Small Signal Amplifiers –CE & CC Amplifiers.

UNIT-II

Operational Amplifiers and Applications: Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; Op-Amp Applications - Inverting, Non-Inverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator.

UNIT-III

Digital Electronics: Logic Gates, Simple combinational circuits–Half and Full Adders, BCD Adder. Latches and Flip-Flops (S-R, JK and D), Shift Registers and Counters. Introduction to Microcontrollers and their applications (Block diagram approach only).

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education, 2007.
2. Principles of Electronics, V.K. Mehta, Rohit Mehta, S Chand.
3. Operational Amplifiers with Linear Integrated Circuits, William D. Stanley, 4th Edition, Pearson.
4. R. P. Jain, Modern Digital Electronics,3rd Edition, Tata Mcgraw Hill,2003.

Reference Books:

1. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
2. R. S. Sedha, A Text Book of Electronic Devices and Circuits, S.Chand& Co, 2010.
3. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4thEdition, Pearson, 2017.
4. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd Edition, Pearson, 2012.

<table>
<tr><td>Course Title</td><td colspan="5">Engineering Workshop</td><td colspan="3">B.Tech CSE I Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20EW105</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Sheet metal operations,
● Fitting
● Electrical house wiring skills
● Wood working</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Apply wood working skills in real world applications</td></tr>
<tr><td>CO 2</td><td colspan="8">Build different objects with metal sheets in real world applications</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply fitting operations in various applications</td></tr>
<tr><td>CO 4</td><td colspan="8">Apply different types of basic electric circuit connections</td></tr>
<tr><td>CO 5</td><td colspan="8">Use soldering and brazing techniques</td></tr>
</table>

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints

Half – Lapjoint

Mortise and Tenonjoint

Corner Dovetail joint or Bridlejoint.

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets

a)Taperedtray b) Conicalfunnel c)Elbowpipe d)Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises

a) V-fit b)Dovetailfit c) Semi-circularfit d) square fitting

Electrical Wiring:
Familiarities with different types of basic electrical circuits and make the following connections
a) Parallelandseries b) Twowayswitch c)Godownlighting d) Tubelight
e) Threephasemotor f) Soldering ofwires

Note: In each section a minimum of three exercises are to be carried out.

Text Books:

1. Mechanical Workshop Practice, K.C. John, 2nd Edition, PHI.
2. Engineering Workshop, Lindsay White, Oxford University Press.

Reference Books:

1. Mechanical Experiments and Workshop Practice, G.S. Sawhney, IK International Pvt Ltd.

<table>
<tr><td>Course Title</td><td colspan="5">IT Workshop</td><td colspan="3">B.Tech I Sem (CSE, ME) (R20)
B.Tech II Sem (CE,EEE, ECE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005106
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2005206
(II Sem)</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system.
● To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX.
● To learn about Networking of computers and use Internet facility for Browsing and Searching</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Disassemble and Assemble a Personal Computer and prepare the computer ready use.</td></tr>
<tr><td>CO 2</td><td colspan="8">Prepare the Documents using Word processors and Prepare spread sheets for calculations .using excel and also the documents using LAteX.</td></tr>
<tr><td>CO 3</td><td colspan="8">Prepare Slide presentations using the presentation tool.</td></tr>
<tr><td>CO 4</td><td colspan="8">Interconnect two or more computers for information sharing.</td></tr>
<tr><td>CO 5</td><td colspan="8">Access the Internet and Browse it to obtain the required information.</td></tr>
</table>

Preparing your Computer

Task 1:
Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2:
Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non- working parts. Student should identify the problem correctly by various methods.

Task 3:
Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4:
Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

Networking and Internet
Task 5:

Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6:
Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email.

They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating email account.

Task 7:
Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8:
Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered,
Image Manipulation tools.

Task 9:
Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10:
Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet.

Task 11:

LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross- referencing (refer to sections, table, images), bibliography (references).

Text Books:

1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, PowerPoint & Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI

Reference Books:

1. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH.
2. Lamport L. LATEX: a document preparation system: user's guide and reference manual, Addison-wesley; 1994.
3. The Complete Reference PC Hardware, Craige Zacker, John Rourke, Tata McGraw Hill.
4. Microsoft Office 365 & Office 2019 Introductory, Sandra Cable, Steven M. Freund, Ellen Monk, Susan L. Sebok, Joy L. Starks, and Misty E. Vermaat, Cengage.

<table>
<tr><td>Course Title</td><td colspan="4">Chemistry Lab</td><td colspan="3">B.Tech CSE I Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2023107</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To verify the fundamental concepts with experiments.
● The student will have exposure to various experimental skills and hand-on experience which is very essential for an Engineering student.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Determine the cell constant and conductance of solutions.</td></tr>
<tr><td>CO 2</td><td colspan="8">Synthesis of advanced polymer Bakelite.</td></tr>
<tr><td>CO 3</td><td colspan="8">Calculate the strength of an acid present in secondary batteries.</td></tr>
<tr><td>CO 4</td><td colspan="8">Illustrate the IR of some organic compounds</td></tr>
<tr><td>CO 5</td><td colspan="8">Explain acid-base titrations using pH metry.</td></tr>
</table>

List of Experiments:

1. Conductometric titration of strong acid vs. strong base.
2. Conductometric titration of weak acid vs. strong base
3. pH metric titration of strong acid vs. strong base.
4. pH metric titration of weak acid vs. strong base
5. Determination of cell constant and conductance of solutions
6. Potentiometry - determination of redox potentials and emfs
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of Bakelite.
9. Verify Lambert-Beer’s law
10. Thin layer chromatography
11. Identification of simple organic compounds by IR.
12. Preparation of nanomaterial’s by precipitation
13. Estimation of Ferrous Iron by Dichrometry.

Text Books:

1. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et.al., Pearson Education, Sixth Edition, 2012.

2. Laboratory manual on Engineering Chemistry, Anupama Rajput, Dhanpat Rai& Co Publications.

3. Essentials of Experimental Engineering Chemistry, Shashichawla, DhanpatRai& Co Publications.

<table>
<tr><td>Course Title</td><td colspan="4">C Programming & Data Structures Lab</td><td colspan="3">B.Tech I Sem (CSE, EEE, ME) (R20)
B.Tech II Sem (CE, ECE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005108
(I Sem)
2005208
(II Sem)</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- know how to write and debug programs
- know the principles of designing structured programs
- Write basic C programs using, Selection statements, Repetitive statements,
- Functions, Pointers, Arrays, Strings and structures
- To apply suitable data structure to solve real world problems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply engineering knowledge for decision making statements to solve complex problems.
CO 2	Translate given algorithms to a working and correct programs.
CO 3	Develop iterative as well as recursive programs for complex problems.
CO 4	Represent data in arrays, strings and structures and manipulate them through a program.
CO 5	Write programs on data structures like stack, queue, linked list, trees etc., for social relevant problems.

1. Ramesh 's basic salary is input through the keyboard. His dearness allowance is 40% of basic salary and house rent allowance is 20% of basic salary. Write a C program to calculate his gross alary.
2. Write a program to take input of name, roll no and marks obtained by a student in 5 subjects each have its 100 full marks and display the name, roll no with percentage score secured.
3. a) Write a C program to find out whether a given number is even number or odd number.
   b) Write a C program to check whether a given year is leap year or not.
4. Design and develop an algorithm that takes three coefficients ($\boldsymbol{a}$, $\boldsymbol{b}$, and $\boldsymbol{c}$) of a Quadratic equation ($\boldsymbol{a}x^2+\boldsymbol{b}x+\boldsymbol{c}=0$) as input and compute all possible roots. Implement a C program for the developed algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.

5. If the ages of the Ramesh, Suresh and Mahesh are input through the keyboard, write a C program to determine youngest of the three.

6. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if- else and switch case. The following table shows the range of ASCII values for various characters.

Characters	**ASCII values**
A–Z	65 – 90
a– z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127.

7. Write a C program which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).

8. Design and develop an algorithm to find whether a given number is Armstrong number or not. Implement a C program for the developed algorithm.
9. Design and develop an algorithm to check whether a given number is palindrome or not. Implement a C program for the same.
10. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
11. Write a C program to generate the first N terms of Fibonacci sequence.
12. Write a C program to find the smallest and largest number in a given array.
13. Write a C program to find the frequency of a particular number in a list of integers.
14. Write a C program to sort the list of elements using

a) Bubble Sort b) Selection sort.

15. Write a C program to search for an element in a list of elements using

a) Linear search b) Binary search

16. Write a C program to read two matrices and perform the following operations

a) Addition of two matrices

b) Multiplication of two matrices

17. Partitioning an array

Given a randomly ordered array of n elements, write a C program to partition the elements into two subsets such that elements ≤X are in one subset and elements ≥X are in another subset.

18. Write a C program to rearrange the elements in an array so that they appear in reverse order.

19. If a string and its reversed string are same then the string is called as palindrome string. Design and develop an algorithm to check whether a given string is a palindrome or not and implement a C program for the same.

20. Write a C program to read two strings and perform the following operations without using built string library functions.

i) String length ii) String reversing

iii) Comparison of two strings iv) Concatenation of two strings

21. Write a C program to count the number of vowels, consonants, digits, blank space sand special characters in a given string.

22. Write a C program to swap the contents of two variables using

a) Call by value

b) Call by reference.

23. Write a C program using recursion to

a) Find the factorial of a given number

b) Print the Fibonacci series up to a given number.

c) Find the GCD of two integers.

24. Write a C program to define a structure with the following members.

Roll No., Name, marks in Sub1, Sub2, Sub3. Read the n students records and find the total marks of each student and print the result in the following format.

Roll No	**Name**	**Sub1**	**Sub2**	**Sub3**	**Total marks**	**Result**
239Y1A0501	Siva	80	70	75	225	Distinction

25. Write C programs that implement stack (its operations) using

i) Arrays

ii) Pointers

26. Write C programs that implement Queue (its operations) using

i) Arrays

ii) Pointers

27. Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

28. Write a C program that uses functions to perform the following operations on single linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

29. Write a C program that uses functions to perform the following operations on Double linked list.

i) Creation ii) Insertion iii) Deletion iv) Traversal

30. Write a C program that uses functions to perform the following:

i) Creating a Binary Tree of integers

ii) Traversing the above binary tree in preorder, inorder and postorder.

Text Books:

1. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
2. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
3. Rema Theraja, Programming in C, second edition,Oxford.
4. E. Balagurusamy, C Programming and Data structures, Fourth Edition, McGrawHill.

Reference books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson.
3. Yashavant Kanetkar, Let us C, 15th edition, BPBPublications.
4. Dr. P. Chenna Reddy, Computer Fundamentals and C Programming, Second Edition.

<table>
<tr><td>Course Title</td><td colspan="4">Basic Electrical & Electronics Engineering Lab
Part ‘A’: Basic Electrical Engineering Lab
Part ‘B’: Electronics Engineering Lab</td><td colspan="3">B.Tech CSE I Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
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<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
The objective of the course is to verify KCL, KVL, superposition theorem, measurement of real & reactive power for RL & RC circuits, performance characteristics of DC machines and transformers. Analyze the characteristics of Diodes, BJT, MOSFET, UJT, design the amplifier circuits from the given specifications and verification of truth tables.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Verify Kirchhoff’s laws, superposition theorem theoretically and practically for any given circuit, truth table for different logic gates and measure real & reactive power for RL & RC circuits.</td></tr>
<tr><td>CO 2</td><td colspan="8">Illustrate various characteristics of DC machines from the measured data (Practically).</td></tr>
<tr><td>CO 3</td><td colspan="8">Obtain the efficiency and regulation for single phase transformer</td></tr>
<tr><td>CO 4</td><td colspan="8">Learn the characteristics of basic electronic devices like PN junction diode, Zener diode & BJT</td></tr>
<tr><td>CO 5</td><td colspan="8">Analyze the application of diode as rectifiers, clippers and clampers and other circuits</td></tr>
</table>

Part A: Basic Electrical Engineering Lab

List of experiments: -

Basic Electrical Engineering Lab (Any 5 experiments)

1. Verification of Kirchhoff laws
2. Verification of Superposition Theorem
3. Magnetization characteristics of a DC Shunt Generator
4. Speed control of DC Shunt Motor
5. OC & SC test of 1 – Phase Transformer

6. Load test on 1-Phase Transformer
7. Brake test on DC Shunt Motor
8. Measurement of Real & Reactive Power by single phase RL,RC circuits

Text Books:

1. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.
4. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.

References:

1. Fundamentals of Electrical Engineering-I, Don Johnson, University Press.
2. Basic Electrical Engineering, SK. Sahdev, Pearson.
3. Basic Electrical Engineering, Abhijith Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, Tata McGraw Hill.
4. Basic Concepts of Electrical Engineering, Kuldeep Sahay, Shivendra Pathak, New Age International Publishers.

Part B: Electronics Engineering Lab

List of Experiments:

Basic Electronics Engineering Lab (Any 5 experiments)

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Full Wave Rectifier with & without filter.
4. Wave Shaping Circuits. (Clippers & Clampers)
5. Input & Output characteristics of Transistor in CB / CE configuration.
6. Frequency response of CE amplifier.
7. Inverting and Non-inverting amplifiers using Op-AMPs.
8. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education, 2007.
2. Principles of Electronics, V.K. Mehta, Rohit Mehta, S Chand.
3. Operational Amplifiers with Linear Integrated Circuits, William D. Stanley, 4th Edition, Pearson.
4. R. P. Jain, Modern Digital Electronics,3rd Edition, Tata Mcgraw Hill,2003.

Reference Books:

1. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
2. R. S. Sedha, A Text Book of Electronic Devices and Circuits, S.Chand& Co, 2010.
3. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4thEdition, Pearson, 2017.\
4. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd Edition, Pearson, 2012.

B.Tech II SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="5">Differential Equations And Vector Calculus</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2021201</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To enlighten the learners in the concept of differential equations.
● To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Classify second and higher order liner D.E’s with constant coefficients.</td></tr>
<tr><td>CO 2</td><td colspan="8">Solve partial differential equations.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze the applications of partial differential equations.</td></tr>
<tr><td>CO 4</td><td colspan="8">Understand vector differentiation concepts.</td></tr>
<tr><td>CO 5</td><td colspan="8">Apply vector integration concepts.</td></tr>
</table>

UNIT- I

Linear differential equations of higher order (constant coefficients) :

Definitions, homogeneous and non- homogeneous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters.

UNIT-II

Partial Differential Equations:

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange’s method.

UNIT-III

Applications of Partial Differential Equations:

Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation.

UNIT-IV

Vector differentiation:

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT-V

Vector integration:

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and applications of these theorems.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013
3. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, Pearson, 9th Edition, Reprint, 2002.
4. Advanced Engineering Mathematics, Greenberg Michael D, Cengage Publishers.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.
3. Applied Calculus, Hegarty John C.
4. Advanced Calculus, Widder V David, Pearson Publishers.

Course Title	Applied Physics					B.Tech CSE II Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20AP202	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To make a bridge between the physics in school and engineering courses.
- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
- To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory of solids.
- Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Study the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
CO 2	Identify the wave properties of light and the interaction of energy with the matter (L3). Asses the electromagnetic wave propagation and its power in different media (L5).
CO 3	Understands the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3)
CO 4	Study the quantum mechanical picture of subatomic world along with the discrepancies between the classical estimates and laboratory observations of electron transportation phenomena by free electron theory and band theory. (L2)
CO 5	Elaborate the physical properties exhibited by materials through the understanding of properties of semiconductors and superconductors. (L5)

UNIT-I: Wave Optics

Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.

Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

<u>UNIT-II</u>: Lasers and Fiber optics

Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Semiconductor diode laser- Applications of lasers.

Fiber optics- Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Block diagram of Optical fiber Communication system - Propagation Losses (qualitative)
– Applications.

<u>UNIT-III</u>: Dielectric and Magnetic Materials

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

Magnetic Materials- Introduction to magnetic materials (Origin of magnetic moment of an atom and Classification of magnetic materials) –Weiss theory of ferromagnetism- soft ferrites and hard ferrites- Hysteresis – Soft and Hard magnetic materials- Applications magnetic materials.

<u>UNIT IV</u>: Quantum Mechanics, Free Electron Theory

Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one- dimensional infinite potential well.

Free Electron Theory- Classical free electron theory (Merits and demerits only) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Density of states – Fermi energy.

<u>UNIT – V</u>: Semiconductors and Superconductors

Semiconductors- Introduction – Intrinsic semiconductors – Electrical conductivity – Fermi level – Extrinsic semiconductors –Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.

Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) –High T_c superconductors – Applications of superconductors.

Text books:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Krishnasagar,S. Chand and Company
2. Optics- Ajoy Ghatak , McGraw Hill Publishers,6th edition,1st January,2018.
3. Fundamental of Physics- Halliday, Resnick and Walker, Wiley publications.
4. Solid State Physics, Hall H E, paramount Publications.

Reference Books:

1. Engineering Physics – K.Thyagarajan, McGraw Hill Publishers
2. Semiconductor Devices-S.M.Sze , Wiley Publications.
3. Lasers & Non-linear Optics Nelkon M parker P, Arnold Heinemann Publications
4. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill

<table>
<tr><td>Course Title</td><td colspan="4">Communicative English</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2024203</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Retrieve the knowledge of basic grammatical concepts
CO 2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
CO 3	Apply grammatical structures to formulate sentences and correct word forms.
CO 4	Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO 5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO 6	Create a coherent paragraph interpreting a figure/graph/chart/table.

UNIT-I

Lesson: On the Conduct of Life: William Hazlitt

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others. **Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information. **Writing :**Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. Grammar and Vocabulary: Parts of Speech; Word formation, synonyms and antonyms; Idioms and Phrases; phrasal verbs.

UNIT-II

Lesson: The Brook: Alfred Tennyson

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Sentence structure; articles; Tenses; Prepositions.

UNIT-III

Lesson: A City Night Peace - Oliver Goldsmith

Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.**Writing:** Summarizing, Paragraph Writing **Grammar and Vocabulary:** Voice; Reported Speech; Degrees of Comparison, Subject with agreement.

UNIT-IV

Lesson: Being Rich, Being Good - Chetan Bhagat

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing **Grammar and Vocabulary:** Information Transfer; Simple, Compound and Complex sentences; Question Tags.

UNIT-V

Lesson: Politics and the English Language: George Orwell

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Reading: Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences.

Grammar and Vocabulary: Reading Comprehension; Dialogue Writing; Common Errors.

Text Books:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12^{th} Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler.

Web links:

www.englishclub.com

www.easyworldofenglish.com

www.languageguide.org/english/

www.bbc.co.uk/learningenglish

www.eslpod.com/index.html

www.myenglishpages.com

<table>
<tr><td>Course Title</td><td colspan="4">Python Programming</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005204</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Understand programming skills using basics of Python language.
- To introduce the object-oriented programming concepts.
- Acquire basics of how to translate problem into object-oriented form.
- To understand object-oriented programming concepts, and apply them in solving problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate and acquire knowledge on usage of Data types, operators, input output statements in python programming
CO 2	Analyze the given problem and develop python program to solve the problem
CO 3	Use proper iterative statements in problem solving
CO 4	Identify the right sequence to solve the real-world problems
CO 5	Apply object-oriented features to solve real time applications

UNIT I

Features of python, Execution of a python program, comments, identifiers and variables, classification of data types, keywords, constants, Naming conventions in python, Operators and expressions, operator precedence and associativity, input and output statements.

UNIT II

Control statements: simple if, if..else, nested if, if..elif..else statement. **Loops:** while loop, for loop, nested loops, break , continue , pass and assert statements, Arrays in python, Strings and their operations.

UNIT III

Functions: define and calling a function, return statement, formal and actual arguments, local and global variables, passing arguments to function, anonymous functions, example programs on functions, recursion.

UNIT IV

Sequences: Lists, Tuples, Sets, Dictionaries, Operations and methods on Tuples, Lists, Dictionaries.
Files: Types of files, opening file, closing a file, write data into a file, read data from a file.

UNIT V

Introduction to Oops:, Introduction to class and objects, self variable in python, constructor, types of variables and methods, Inheritance and polymorphism, abstract class.

Text Books:

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
4. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018

Reference Books:

1. Python: The complete reference by Martin C Brown, McGraw-Hill Publication, 2018.
2. Programming Python, Mark Lutz,4th Edition, O'Reilly publications.
3. Dive into Python, Mark Pilgrim, APress Media, LLC.

<table>
<tr><td>Course Title</td><td colspan="5">Engineering Drawing</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2003205</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>1</td><td>0</td><td>2</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Bring awareness that Engineering Drawing is the Language of Engineers.
● Familiarize how industry communicates technical information.
● Teach the practices for accuracy and clarity in presenting the technical information. Develop the engineering imagination essential for successful design</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Draw various curves applied in engineering.</td></tr>
<tr><td>CO 2</td><td colspan="8">Show projections of solids and sections graphically.</td></tr>
<tr><td>CO 3</td><td colspan="8">Draw the development of surfaces of solids.</td></tr>
<tr><td>CO 4</td><td colspan="8">Know draw orthographic and isometric projections.</td></tr>
<tr><td>CO 5</td><td colspan="8">Evaluate different methods of perspective view.</td></tr>
</table>

<u>UNIT-I</u>

Introduction to Engineering Drawing: Principles of Engineering Drawing and its Significance- Conventions in drawing-lettering - BIS conventions.

a) Conic sections including the rectangular hyperbola- general methodonly,

b) Cycloid, epicycloids andhypocycloid c) Involutes

<u>UNIT- II</u>

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

<u>UNIT- III</u>

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Development of surfaces: Development of surfaces of right regular solids- prism, cylinder, pyramid, cone and their sectional parts.

UNIT-IV

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

UNIT- V

Perspective projection –applications of perspective view –terminology of perspective view- methods of drawing perspective view-simple problems.

Text Books:

1. K.L.Narayana &P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016.
3. Interpreting Engineering DrawingsBook by Ted Branoff.
4. Mechanical Drawing: Board & CAD TechniquesBook by Jay D. Helsel.
5. A Textbook of Engineering Drawing: For Undergraduate ...Book by Addisu Dagne Zegeye

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right,2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers,2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009
4. K.C.John, Engineering Graphics, 2/e, PHI,2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Sketch up for Dummies book by Bill Fane, Josh Reilly, and Mark Harrison

Additional Sources:

1. Youtube: http-sewor, Carleton. cag,kardos/88403/drawings.html conic sections-online, red woods.edu.

Note: The distribution of marks shall be 30 for internal evaluation and 70 for end examination.. In the Internal evaluation 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the submissions prepared in the class. Further, there shall be two midterm exams in a Semester evenly distributed over the syllabi for 15 marks. Total internal marks for midterm exams will be evaluated by giving 80% weightage to the better mid exam and 20% to the other mid examination. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject.

<table>
<tr><td>Course Title</td><td colspan="4">Engineering Drawing Lab</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2003206</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Bring awareness that Engineering Drawing is the Language of Engineers.
● Familiarize how industry communicates technical information.
● Teach the practices for accuracy and clarity in presenting the technical information.
● Develop the engineering imagination essential for successful design.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Use computers as a drafting tool.</td></tr>
<tr><td>CO 2</td><td colspan="8">Draw isometric and orthographic drawings using CAD packages</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze orthographic drawings using CAD packages.</td></tr>
</table>

Computer Aided Drafting:

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.
Dimensioning principles and conventional representations.

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines, planes, simple solids.

Text Books:

1. K. Venugopal, V.Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.
3. Mechanical Drawing: Board & CAD TechniquesBook by Jay D. Helsel.
4. A Textbook of Engineering Drawing: For Undergraduate ...Book by Addisu Dagne Zegeye

Reference Books:

1. T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
2. LinkanSagar, BPB Publications, Auto Cad 2018 Training Guide.
3. K.C.John, Engineering Graphics, 2/e, PHI,2013
4. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Additional Sources:

1. Youtube: http-sewor,Carleton.cag, kardos/88403/drawings.html
   conic sections-online, red woods.edu

<table>
<tr><td>Course Title</td><td colspan="5">Applied Physics Lab</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20AP207</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Understands the concepts of interference, diffraction and their applications.
● Understand the role of optical fiber parameters in communication.
● Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
● Illustrates the magnetic and dielectric materials applications.
● Apply the principles of semiconductors in various electronic devices.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Operate various optical instruments (L2)</td></tr>
<tr><td>CO 2</td><td colspan="8">Estimate wavelength of laser and particles size using laser(L2)</td></tr>
<tr><td>CO 3</td><td colspan="8">Evaluate the acceptance angle of an optical fiber and numerical aperture (L3)</td></tr>
<tr><td>CO 4</td><td colspan="8">Estimate the susceptibility and related magnetic parameters of magnetic materials (L2)</td></tr>
<tr><td>CO 5</td><td colspan="8">Apply the concepts of ultrasonics by acoustic grating (L2)</td></tr>
</table>

Note: In the following list, out of 15 experiments, any 12 experiments (minimum 10) must be performed in a semester

List of Applied Physics Experiments

1. Determine the thickness of the wire using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. Determination of particle size using LASER.
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Determination of dielectric constant by charging and discharging method.

9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
10. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
11. To determine the resistivity of semiconductor by Four probe method
12. To determine the energy gap of a semiconductor

Text Books:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

Course Title	Communicative English Lab					B.Tech CSE II Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2024208	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- Students will be exposed to a variety of self-instructional, learner friendly modes of language learning.
- Students will learn better pronunciation through stress, intonation and rhythm.
- Students will be trained to use language effectively to face interviews, group discussions, and public speaking.
- Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Listening and repeating the sounds of English Language
CO 2	Understand the different aspects of the English language, proficiency with emphasis on LSRW skills.
CO 3	Apply communication skills through various language learning activities
CO 4	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension
CO 5	Evaluate and exhibit acceptable etiquette essential in social and professional settings
CO 6	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

UNIT-I

- Listening Skills
- Phonetics
- Introducing oneself

UNIT-II

- Describing objects
- JAM / Interpretation of Hypothetical Situations
- Role play

UNIT-III

- Hypothetical situations (If… were)
- Elocution
- TED talks videos

UNIT-IV

- Visual Description
- Situational conversations

UNIT-V

- Oral Presentations
- PowerPoint presentations

Suggested Software:

- Orell
- Walden Infotech
- Young India Films
- K-Van solutions

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links:

www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

<table>
<tr><td>Course Title</td><td colspan="4">Python Programming Lab</td><td colspan="3">B.Tech CSE II Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005209</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To write, test, and debug simple Python programs.
- Know when and how to use the appropriate statements available in the python
- To implement Python programs with conditionals and loops
- Use functions for structuring Python programs
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand and implement the basic syntax of decision and iterative statements in python
CO 2	Apply recursive functions to implement searching and sorting methods
CO 3	Apply and implement the operations of List, Tuple, Dictionaries, Stack and Queues
CO 4	Implement programs using object-oriented features in python
CO 5	Develop python programs using File concepts

List of Sample Experiments:

1. Calculate the following programs using Python
   a) Area of Circle
   b) Simple and Compound Interest
   c) Celsius to Fahrenheit
   d) Volume of Sphere

2. Write a Python program to find distance between two points (X1, Y1) and (X2, Y2).

3. Implement the following programs using Python
   a) To find given number is Even or Odd number
   b) Find Maximum of Two numbers
   c) Find given number is Zero, Positive or Negative
   d) Find Minimum of Two numbers
   e) Find given year is leap year or not

4. Write a Python program to find Roots of Quadratic equation.

5. Write a Python program to read credits and grades of five different subjects and display SGPA based on the following table.

Class	SGPA
Distinction	>=7.5
First Class	>=6.5 <7.5
Second Class	>=5.5 <6.5
Pass	>=4.5 <5.5
Fail	<4.5

$$\text{SGPA}=\frac{\sum(Ci*Gi)}{\sum Ci}$$

6. Write a Python program to design arithmetic calculator based on user choice like 1. Addition 2. Subtraction 3. Multiplication 4. Division.

7. Implement the following programs using Python

a) Sum of Digits of a given number
b) Given number is Palindrome or not
c) Find given number is Armstrong number or not
d) Factorial of a given number

8. Write a Python program to display sum of even valued terms and odd valued terms individually by considering terms of Fibonacci series upto n.

9. Implement the following search strategies using Python

a) Linear search b) Binary search

10. Perform the following sorting techniques using Python

a) Selection sort b) Insertion sort c) Merge sort

11. Implement the following programs using Python

a) Given number is Prime or not
b) Display Prime numbers upto given number n

12. Implement the following programs using Python

a) Addition of Two Matrices
b) Multiplication of Two Matrices

13. Implement the following programs using Python

a) Count number of Even and Odd numbers in list
b) Remove all duplicate elements in a list
c) Find Second smallest element in a list
d) Find Second largest element in a list

14. Implement the following programs using Python

a) Reverse elements of a list without using reverse( ) function

b) Find GCD, LCM of two numbers. Each function should not exceed one line

c) Write a Python function, that takes two lists and returns True if they have at least one common number.

15. Implement the following programs using Python

a) Reverse the string without reverse( ) function

b) Find list of words that are larger than n from a given list of words

16. Write a Python program to build Stack data structure using list.
(Hint: 1. Push 2. Pop 3. Peep 4. Display 5. Exit)

17. Write a Python program to build Queue data structure using list.
(Hint: 1. Insert 2. Delete 3. Display 4. Exit)

18. Write a Python program to check whether a list contains a sub list.

19. Write a Python program to perform the following operations on Tuple based on the user choice.

(Hint: 1. Insert 2. Delete 3. Search 4. Display 5. Exit)

20. Implement the following programs using Python

a) Create a dictionary with student names and marks. Retrieve marks by entering the student name.

b) Find the number of occurrences of each letter in a string using dictionary.

21. Write a Python program to create a student class, that reads n student details like name, marks, gender etc. Calculate and display total marks, percentage and grade.

22. Write a Python program to create a parent class and child class along with their own methods. Access parent class members in child class to implement the following sceneries.

a) Single level Inheritance

b) Multi level Inheritance

c) Multiple Inheritance

23. a) Write a Python program to overload the addition operator '+' to make it act on class objects.

b) Write a Python program to overload sum( ) method of class student

c) Write a Python program to override the area( ) method of square class.

(Hint: parent class ⇢ square, child class⇢ circle)

24. Create a 'car' abstract class, which contains abstract methods along with concrete methods. Write a Python program to implement super class 'car' in sub class 'Maruthi'.

25. a) Write a program to print each line of a file in reverse order

b) Write a program to compute the number of characters, words and lines in a file.

<u>Text Books:</u>

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
4. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018

<u>Reference Books</u>:

1. Python: The complete reference by Martin C Brown, McGraw-Hill Publication, 2018.
2. Programming Python, Mark Lutz,4th Edition, O'Reilly publications.
3. Dive into Python, Mark Pilgrim, APress Media, LLC.

Course Title	Environmental Science					B.Tech CSE II Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20MC210	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**0**	**40**	**--**	**40**
Mid Exam Duration: 90 Minutes								

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life.
- To save earth from the inventions by the engineers.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	**Explain** multidisciplinary nature of environmental studies and various Renewable and Nonrenewable resources.
CO 2	**Understand** the Energy flow, bio-geo chemical cycles and ecological pyramids
CO 3	**Illustrate** various causes of pollution and related preventive measures.
CO 4	**Summarize** Solid waste management, Social issues related to environment and their protection acts.
CO 5	**Evaluate** Causes of population explosion, value education and welfare programmes.

UNIT – I

Multidisciplinary Nature Of Environmental Studies: –Scope and Importance – Need for Public Awareness.

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

Forest resources: deforestation, case studies – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water conflicts over water. **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Renewable &Non-Renewable.

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Food chains, food web- Ecological succession and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.

b. Desert ecosystem

c. Aquatic ecosystems (lakes, rivers and oceans)

Biodiversity And Its Conservation : Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

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

a. Air Pollution.

b. Water pollution

c. Soil pollution

d. Marine pollution

e. Noise pollution

f. Thermal pollution

g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues And The Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents.Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses, Erach Bharucha for University Grants Commission, Universities Press.
2. Fundamental Concepts of Environmental Chemistry- Sodhi G S – Oxford University
3. Environmental Chemistry- Anil Kumar De-Willey Publications
4. Environment Impact Assessment- Larry W. Canter- Mc Graw Hill publications

Reference Books:

1. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
2. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.
3. Environmental Science, A Global Concerns, William P. Cunningham, Mary Ann Cunningham, Mc Graw Hill publications.
4. Environmental Science & Engineering, Glynn Henry J ,Heinke Gary w, Pearson publications

B.Tech III SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="4">Business Economics and Accounting for Engineers</td><td colspan="4">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2024301</td><td rowspan="2">HSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To equip the budding engineering student with an understanding of concepts and tools of economic analysis.
● To provide knowledge of Business economics through differential economics concepts and theories.
● To make aware of accounting concepts to analyze and solve complex problems relating financial related matters in industries.
● To understand professional and ethical responsibility and ability to communicate effectively.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the concept of Business Economics and able to apply.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the Production functions and application of Business Economics and Accounts for making business decisions.</td></tr>
<tr><td>CO 3</td><td colspan="8">To Analyze the markets conditions and determine price-output relations.</td></tr>
<tr><td>CO 4</td><td colspan="8">To understand the concepts of Accounting and able to prepare the financial statement of a business firm.</td></tr>
<tr><td>CO 5</td><td colspan="8">To evaluate, analyze and interpret the financial performance of business.</td></tr>
</table>

UNIT – I

INTRODUCTION TO BUSINESS ECONOMICS

Meaning, Definition, Nature and scope of Business Economics, Demand Analysis: Concept of Demand, Determinants of demand, Law of Demand and its exceptions, Elasticity of Demand – Types, Measurement of Elasticity of Demand, Demand Forecasting – Techniques of Demand Forecasting.

UNIT – II

THEORY OF PRODUCTION AND COST ANALYSIS

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III

CLASSIFICATION OF MARKETS AND PRICING METHODS

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.

Methods of Pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV

INTRODUCTION TO FINANCIAL ACCOUNTING

Definition to Accounting, objective and need for Accounting, Double Entry Book keeping– Accounting process, Journal Ledger, Trial Balance, and Final Accounts – Trading Account, Profit and Loss Account and Balance sheet with problems.

UNIT – V

FINANCIAL ANALYSIS THROUGH RATIOS

Concept of Financial Ratios , Types of Ratios – Liquidity Ratios, Turnover Ratios, Capital Structure Ratios, Profitability Ratios with problems.

Text Books:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K K Dewett - Managerial Economics, S. Chand Publishers.
3. Varshney & Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
4. Prasad and K.V.Rao: Financial Accounting, Jai Bharath Publishers, Vijayawada.
5. A.R. Aryasri: Managerial Economics and Financial Analysis, TATA McGraw-Hill Publishing Co. Ltd.

Reference Books:

1. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
2. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.
3. Paul A Samuleson and William nordhaus : Economics, Oxford University Publications.
4. M L Jhingan : Micro Economics & Macro Economics, Vrinda Publacations (P) Ltd.

<table>
<tr><td>Course Title</td><td colspan="4">Advanced Data Structures</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005302</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To develop skills and analyze linear and non linear data structures.
- To understand basic concepts of stacks and queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting, dictionaries and hashing.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the variety of abstract data types and data structures.
CO 2	Analyze data structures such as linked list, Stacks and Queues.
CO 3	Apply and analyze tree traversal algorithms.
CO 4	Analyze graph traversal algorithms and organize data using various sorting algorithms.
CO 5	Ability to understand the concept of hashing, B-Trees and B+-Trees.

UNIT-I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & Non Linear data structures, **Linear Lists:** Definition, **Arrays:** Definition, **Stacks:** Definition, Array & Linked representations, Operations, Applications

UNIT-II

Queues: Definition, Array & Linked representations, Operations, Circular Queues & Dequeues.

Trees: Basic terminology, Binary Trees- Definition, Properties, Representation, Complete and Full Binary Tree.

UNIT-III

Tree Traversal Algorithm: Inorder, Preorder and Post order.

Priority Queues: Definition, Heaps, Leftist Trees.

Binary Search Tree (BST): Definition, Operations & Implementations, BST with Duplicates, Indexed BST. **Balanced Search Trees:** AVL, Red-Black & Splay Trees.

UNIT-IV

Graphs: Terminology, Representations **Graph Traversal:** Depth First Search (DFS), Breadth First Search (BFS), Minimum Spanning Tree.

Sorting: Quick, Merge, Heap.

UNIT-V

Dictionaries, Linear List Representation, Skip List Representation

Hashing: Introduction, Hash Table representation, Hash Functions.

Collisions: Introduction, Separate Chaining, Open Addressing, B-Trees, Operationson B-Trees,B+-Trees.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universitiespress.
3. Data Structures using C++,Varsha H.Patil, Oxford University Press.
4. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) Private Limited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepogu and Radhik Raju Palagiri, Pearson Education.

<table>
<tr><td>Course Title</td><td colspan="4">Formal Languages And Automata Theory</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005303</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To be able to construct finite state machines and the equivalent regular expressions and prove the equivalence of languages described by finite state machines and regular expressions.
- To be able to construct push down automata and the equivalent context free grammars, Turing machines and Post machines.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand of the notion of a regular set and its representation by DFA's, NFA's and regular expressions.
CO 2	Understand of the notion of a context-free language and its representation by
CO 3	Identify the applications of regular expressions and context-free grammars.
CO 4	Understand the concept of Push Down Automata.
CO 5	Solve to the problems using Turing machines.

UNIT-I

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with Є transitions-Significance, acceptance of languages. Conversions and Equivalence : Equivalence between NFA with and without Є transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

UNIT-II

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

UNIT-III

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and left most derivation of strings.

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free

Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL(proofs omitted).

UNIT-IV

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

UNIT-V

Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, Types of Turing machines (proofs not required).

Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0)grammar, decidability of problems, Universal Turing Machine, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Books:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation - Sipser 2nd edition Thomson.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
4. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Reference Books:

1. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
2. Theory of Computer Science and Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI. 5. Theory of Computation, By K.V.N. Sunitha and N.Kalyani.

<table>
<tr><td>Course Title</td><td colspan="4">Object oriented programming Through Java</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005304</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To give the students a firm foundation on Java concepts like Primitive data types, Java control flow, Methods, Object-oriented programming, Core Java classes, packages and interfaces, multithreading.
● To provide the students with an understanding of Java applets, Abstract Window, Toolkit and exception handling.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Solve problems using object oriented approach and implement them using Java</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply the concept of inheritance, polymorphism and Packages, Interfaces</td></tr>
<tr><td>CO 3</td><td colspan="8">Implement Exception handling and able to develop multithreaded applications with synchronization.</td></tr>
<tr><td>CO 4</td><td colspan="8">Able to develop applets for web applications.</td></tr>
<tr><td>CO 5</td><td colspan="8">Able to design GUI based applications.</td></tr>
</table>

UNIT-I

Object Oriented Programming basics: Need for OOP paradigm, Principles of OOP concepts.

Java Basics: History of Java, Java buzzwords, Simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control**, this** keyword, overloading methods and constructors.

UNIT-II

Inheritance: Inheritance basics, Types of Inheritance, benefits of inheritance, **super** uses, using **final** with inheritance, polymorphism- method overriding, abstract classes. **Packages and Interfaces:** Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-III

Exception handling and multithreading: Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT-IV

Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling Mouse and Keyboard events, Adapter classes, The AWT class hierarchy, user interface components- Labels, Button, Scrollbars, Text Components, Check box, Choices, Graphics, Layout manager types – Flow, Border, Grid, Card and Grid bag.

UNIT-V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an Applet, creating applets, passing parameters to applets.

Swings: Introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, and Tables.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented application development, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

<table>
<tr><td>Course Title</td><td colspan="5">Database Management Systems</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005305</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To study the physical and logical database designs, database modeling, relatio hierarchical, and network models.
● To understand and use data manipulation language to query, update, and manag database.
● To develop an understanding of essential DBMS concepts such as: database secur integrity and concurrency. .</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">To understand the basic concepts and the application of Database systems.</td></tr>
<tr><td>CO 2</td><td colspan="8">To understand the basics of SQL and construct queries using SQL.</td></tr>
<tr><td>CO 3</td><td colspan="8">To understand the Relational Database design principles.</td></tr>
<tr><td>CO 4</td><td colspan="8">To apply various Normalization techniques for database design improvement.</td></tr>
<tr><td>CO 5</td><td colspan="8">To apply concurrency control and recovery techniques during transaction execution.</td></tr>
</table>

UNIT-I

Introduction - Database-System Applications, View of Data, Database languages, Data base architecture, Database Users and Administrators.

E-R Model - The Entity Relationship Model, Constraints, Entity Relationship Diagrams, and Extended E-R features.

UNIT-II

Relational Model - Structure of Relational Databases, Database Schema, Keys, Query Languages, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Modification of Database.

UNIT-III

Introduction to SQL - Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Complex queries, views, Modification of the Database.

Advanced SQL -Integrity Constraints, Dynamic SQL, Functions and Procedures.

Other Relational Query Languages - Tuple Relational Calculus, Domain Relational calculus.

UNIT-IV

Normal Forms – Atomic domain and First Normal Form, Keys and Functional Dependencies, Second Normal Form, BCNF, BCNF and Dependency Preservation, Third Normal Form, Lossless Decomposition, Dependency- preserving, Multi valued Dependencies, Fourth Normal Form, Join Dependencies, Fifth Normal Form, and Inclusion dependencies.

UNIT-V

Transactions -Transaction Concept, Transaction State, Implementation of Transaction Atomicity and Durability, Concurrent Executions, Serializability.

Concurrency Control -Lock-Based Protocols, Timestamp-Based Protocols.

Recovery System - Failure Classification, Storage, Recovery and Atomicity, Log based recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, ”Database system Concepts”, 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems. 3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Reference Links:

1. https://nptel.ac.in/courses/106/105/106105175/ (IIT KHARAGPUR)
2. https://nptel.ac.in/courses/106/106/106106095/ (IIT MADRAS)

<table>
<tr><td>Course Title</td><td colspan="5">Advanced Data Structures Lab</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005306</td><td rowspan="2">PCC (Lab)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
1. To implement linear and non-linear Data Structures.
2. To be able to understand the concept of Stacks and Queues.
3. To be able to understand the concept of trees and tree traversing methods.
4. To be able to understand graph traversal methods and various Sorting algorithms.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Implement the operations of various linear data structures.</td></tr>
<tr><td>CO 2</td><td colspan="8">Implement the ADTof Stack and Queue.</td></tr>
<tr><td>CO 3</td><td colspan="8">Implement the concept Inorder, Preorder and Postorder tree traversing techniques.</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze and implement the Graph traversing methods and Sorting algorithms.</td></tr>
</table>

List of Experiments:

Exercise-1:

a. Write a program to implement Transpose of a given matrix.
b. Write a program to implement Matrix multiplication.

Exercise-2:

a. Write a program to implement Stack operations using arrays.
b. Write a program to convert Infix expression into Postfix expression.

Exercise- 3:

a. Write a program to implement Queue operations using arrays.
b. Write a program to implement Circular Queue operations using arrays

Exercise-4:

Write a programto implement the tree traversal methods.

Exercise-5:

Write a program for Binary Search Tree to implement the following operations.

i) Insertion ii) Deletion

Exercise-6:

a) Write a programto implement Breadth First Search.
b) Write a programto implement Depth First Search.

Exercise-7:

Write a program to implement Linear and Binary search using switch case.

Exercise-8:

a. Write a program to implement Bubble Sort.
b. Write a program to implement Insertion sort.

Exercise-9:

a. Write a program to implement Quick Sort
b. Write a program to implement Merge sort.

Exercise-10:

Write a program to implement Heap sort.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed,
3. Universitiespress.
4. Data Structures using C++,Varsha H.Patil, Oxford University Press.
5. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) Private Limited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepogu and Radhik Raju Palagiri, Pearson Education.

<table>
<tr><td>Course Title</td><td colspan="4">Java Lab</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005307</td><td rowspan="2">PCC (Lab)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA. To familiarize Java environment to create, debug and run simple Java programs.
● To be able to understand Primitive data types, Java control flow, Methods, classes, packages, multithreading and exception handling
● To be able to understand and implement Java applications and applets</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Create, compile, and run Java programs</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply the concept of inheritance and polymorphism</td></tr>
<tr><td>CO 3</td><td colspan="8">Implement Packages, Interfaces and Exception handling</td></tr>
<tr><td>CO 4</td><td colspan="8">Develop windows applications both for standalone and Applets programs by using awt and swings.</td></tr>
</table>

List of Experiments:

Exercise 1: (Basics)

a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

b) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)

Exercise 2: (Basics)

a) Write a Java program to multiply two given matrices.

b) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)

c) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a palindrome.

Exercise 3:(Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.

Exercise 4: (Methods)

a). Write a JAVA program to implement constructor overloading.

b). Write a JAVA program implement method overloading.

Exercise 5: (Inheritance)

a). Write a JAVA program to implement Single Inheritance

b). Write a JAVA program to implement multi level Inheritance

c). Write a java program for abstract class to find areas of different shapes

Exercise 6: (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise 7: (Threads & Packages)

a). 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)

b) Write a Java program to implement packages.

Exercise 8: (Exception Handling)

a).Write a JAVA program that describes exception handling mechanism

b). Write a JAVA program that implements Runtime polymorphism

Exercise 9: (Applet)

a) Write a JAVA program to display analog clock using Applet.

b) Write a JAVA program to create different shapes and fill colors using Applet.

c) Write a Java program to 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.

Exercise 10: (Event Handling)

a) Write a Java program for handling mouse events.

b) Write a Java program for handling keyboard events.

Exercise 11: (Swings)

a) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. (Real Time)

b) Write a JAVA program that to create a single ball bouncing inside a JPanel.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented application development, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

<table>
<tr><td>Course Title</td><td colspan="4">Database Management Systems Lab</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005308</td><td rowspan="2">PCC (Lab)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To give an introduction to systematic database design approaches covering conceptual.
● Design, logical design and an overview of physical design.
● To give a good formal foundation on the relational model of data.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">To understand and develop an Entity-Relationship model based on user requirements and Convert to Relational Schema.</td></tr>
<tr><td>CO 2</td><td colspan="8">Populate and query a database using SQL DML/DDL commands.</td></tr>
<tr><td>CO 3</td><td colspan="8">Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.</td></tr>
<tr><td>CO 4</td><td colspan="8">Programming PL/SQL including stored procedures, stored functions.</td></tr>
</table>

DBMS LAB EXPERIMENTS

1. Draw E-R diagram and convert entities and relationships to relation table for a given scenario.

   COLLEGE DATABASE:

   STUDENT (Rno, SName, Address, Phone, Gender) COURSE(CName)

   BRANCH(Code,BName) SEMSEC (Sem, Sec)

   SUBJECT (Subcode, Title, Sem, Credits)

   IAMARKS (Rno, Subcode, Test1, Test2, Test3, Avg,Rank)

2. Consider University Database and Perform the following:

   a. Viewing all databases
   b. Creating a Database
   c. Viewing all Tables in a Database
   d. Creating Tables (With and Without Constraints)
   e. Inserting/Updating/Deleting Records in a Table
   f. Saving (Commit) and Undoing (rollback)

3. Consider Depttable (DEPTNO, DNAME, LOC) Perform the following:

   a. Rename the table dept as department
   b. Add a new column PINCODE with not null constraints to the existing table DEPT
   c. All constraints and views that reference the column are dropped automatically, along with the column.
   d. Rename the column DNAME to DEPT_NAME in dept table
   e. Change the data type of column loc as CHAR with size 10
   f. Delete table

4. Fo/r a given set of relation schemes, create tables and perform the following: Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With IN clause, With EXISTS clause.

5. For a given set of relation tables perform the following:

   a. Creating Views (with and without check option), Dropping views, Selecting from a view.

6. Write a Pl/SQL program to print integers from 1 to 10 by using PL/SQL FOR loop.

7. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.

8. Write PL/SQL code for finding specific Employee salary in given table.

9. Illustrate how you can embed PL/SQL in a high-level host language such as C/Java and demonstrates how a banking debit transaction might be done.

10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into a given relation.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, ”Database system Concepts”, 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems. 3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Web Links:

SQL and PL/SQL tutorial:

1. **https://www.w3schools.com/sql/,**
2. **http://www.plsqltutorial.com/**

<table>
<tr><td>Course Title</td><td colspan="4">Exploring Data Analysis With R / NASSCOM Courses</td><td colspan="3">B.Tech CSE III Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005309</td><td rowspan="2">Skill Oriented Course</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>1</td><td>2</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● The course enables the students to apply exploring data analysis with R on real time applications.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understanding the basic concepts of R programming.</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply critical R programming concepts to handle the data.</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply statistical concepts on real data.</td></tr>
<tr><td>CO 4</td><td colspan="8">Use linear regression on given data set.</td></tr>
<tr><td>CO 5</td><td colspan="8">Apply data visualization using R packages.</td></tr>
</table>

List of Experiments:

1. Download, install R and RStudio on windows.
2. Study of basic syntaxes in R.
   a. Write a R program to create a sequence of numbers from 20 to 50, find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
   b. Write a R program to get the first 10 Fibonacci numbers.
3. Implementation of different types of R operators.
4. Study and implementation of various control structures in R.
   a. Write a R program to check weather given is even or odd.
   b. Write a R program to find the sum of n natural numbers [1+2+3+…….+n].
   c. Write a R program to get all prime numbers up to a given number.
5. Write a R program to find factorial of a given number using recursive function.
6. Programs using vectors, matrix, factor and list in R.
   a. Write a R program to create a vector of a specified type and length. Create vector of numeric, complex, logical and character type of length 6.
   b. Write a R program to create a matrix taking a given vector of numbers as input and define the column and row names. Display the matrix.
   c. Write a R program to find the levels of factor of a given vector.
   d. Write a R program to create a list containing strings, numbers, vectors and a logical values.
7. Programs using statics (apply all statistical concepts using R)

8. Programs using linear regression.

   Consider the “cars” dataset. Assume “cars$dist” as the response variable and “cars$speed” as the predictor variable. Create a model using the lm() function.

9. Write a R program to create dataframe and extract specific rows and columns.
10. Study and implementation of data visualization using R packages.

Text Books:

1. ROBERT I. KABACOFF "R in Action Data analysis and graphics with R" Manning Publications Co 2011.
2. Aczel−Sounderpandian: "*Complete Business Statistics*" 7th Edition Complete Business Statistics, Seventh Edition McGraw−Hill Primis.
3. Pierre Lafaye de Micheaux, Remy Drouilhet and Benoit Liquet – “ The R Software Fundamentals of Programming and Statistical Analysis”, Springer.

Reference Books:

1. Seema Acharya - *"Data Analytics Using R"* ,Jan 01, 2018, Seema Acharya-MC GRAW HILL INDIA (2018)

Swayam/Nptel/Moocs:

1. https://onlinecourses.nptel.ac.in/noc21_ma35/preview
2. https://www.coursera.org/learn/data-analysis-r

B.Tech IV SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="4">Principles of Operating Systems</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
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<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Have an overview of functions of operating systems.
- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks.
- Learn the concepts of files, protection and security

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the basic concepts related to the operating systems.
CO 2	Analyze the various process scheduling algorithms and process synchronization mechanisms
CO 3	Analyze the various memory management schemes.
CO 4	Understand the ways to deal the deadlocks and the basic concepts related to files in the system.
CO 5	Analyze the protection and security mechanism.

UNIT-I

Operating Systems Basics: Operating systems functions, Overview of computer operating systems, distributed systems, operating system services and systems calls, system programs, operating system structure.

UNIT-II

Process Management: Process concepts, scheduling-criteria, CPU scheduling algorithms, Evaluation of Scheduling Algorithms.

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, semaphores, Classic problems of Synchronization, monitors.

UNIT-III

Memory Management: Introduction**,** Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, Allocation of frames.

UNIT-IV

Deadlocks: system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock.

Files: The concept of a file, Access Methods, File Allocation Methods, Directory structure, File system mounting, File sharing and Protection.

UNIT-V

Protection: Protection, Goals of Protection, Principles of Protection, Domain of protection Access Matrix, Implementation of Access Matrix.

Security: The security problem, Program threats, User authentication.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4^{th} Edition, S Chand Publishers

<table>
<tr><td>Course Title</td><td colspan="4">Computer Organization</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005402</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To make the students understand the structure of computers and internal organization of different units like memory, I/O devices, registers.
- To study in detail about the microoperationsand implementation of fixed and floating point addition, subtraction, multiplication and division operations.
- To study in detail about pipelining, Memory, I/O organization and multiprocessors.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the Basic concepts of computers and Data representation.
CO 2	Understand the concept of Register Transfer and various Micro operations.
CO 3	Understand the concept of basic computer organization and design, Micro programmed control and Computer Arithmetic.
CO 4	Understand the concept of Pipelining and Memory.
CO 5	Understand concept of I/O organization and Multiprocessors.

UNIT-I

Basic Concepts of Computers: Computer Types, Functional units, Basic operational concepts, Bus Structures, Performance. **Data Representation-** Fixed Point Representation, Floating Point Representation.

UNIT-II

Register Transfer and Microoperations: Register Transfer, Bus and memory transfers. Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT-III

Basic Computer Organization and Design: Instruction codes, Computer instructions, Memory Reference Instructions, Input – Output and Interrupt, Addressing modes. **Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Hard wired control, Micro programmed control. **Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms.

UNIT-IV

Pipeline: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline.
Memory: Basic concepts, Memory Hierarchy, Cache memory, Performance considerations, Virtual memory.

UNIT-V

Input-Output Organization: Peripheral Devices, Input- Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access (DMA).
Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures.

Text Books:

1. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.
3. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Reference Books:

1. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi, Springer Int. Edition.
2. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

<table>
<tr><td>Course Title</td><td colspan="5">Micro Processors
&
Micro Controllers</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2004403</td><td rowspan="2">ESC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To become familiar with 8086 Microprocessor and 8051 Microcontroller Architecture, Instructions, Operating Modes and Programming.
● To use 8086 microprocessor and 8051 microcontroller for various applications.
● To study various peripherals for microprocessor based systems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Define various components and list out various features of microproces microcontroller and peripherals.</td></tr>
<tr><td>CO 2</td><td colspan="8">Describe the internal block diagram of microprocessor, microcontroller and peripherals, addressing modes, instruction set and data transfer schemes.</td></tr>
<tr><td>CO 3</td><td colspan="8">Develop algorithm and assembly language programs to solve problems.</td></tr>
<tr><td>CO 4</td><td colspan="8">Apply an appropriate algorithm, program and peripheral for the application.</td></tr>
<tr><td>CO 5</td><td colspan="8">Design the microprocessor or microcontroller based system to solve real time problems. (Prepare a case study model to get a first prototype).</td></tr>
</table>

UNIT-I

The 8086 Microprocessor–Introduction to microprocessors, 8086 microprocessor Architecture, Instruction set, Addressing modes, Interrupt system. Pin diagram, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT- II

Assembly Language Programming: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, look-up tables, string manipulations, Macros and Delay subroutines.

Data transfer schemes and Memory Interfacing: Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Address decoding techniques, Interfacing Static RAM and ROM chips.

UNIT-III

Peripheral Interfacing: 8255 PPI and its interfacing, Programmable Communication Interface (8251 USART) and its interfacing, Programmable Interval Timer (8254) and its interfacing, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, ADC and DAC Interfacing.

UNIT-IV

The 8051 microcontroller: Architecture, pin diagram, memory organization, external memory interfacing, stack, addressing modes, instruction set, Assembler directives, Assembly Language programs and Time delay Calculations, 8051 interrupt structure, 8051 counters and Timers, programming 8051 timers.

UNIT-V

Introduction to ARM: ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table, Instruction Set- Data Processing Instructions, Branch, Load-Store, Software interrupt, PSR instructions, Conditional instructions, Thumb instruction Set: Register Usage, Other Branch instructions, Data processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and its applications with 8085", Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, "The 8051Microcontroller and Embedded Systems", 2nd Edition, Pearson Education, 2008.
4. Kenneth J Ayala, "The 8051 microcontroller: Architecture, Programming & Applications", Penram publications, 2nd edition.
5. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming and Interfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design", 2nd Edition, PHI.
4. Raj Kamal,"Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
5. Steve Furbur, "ARM System on-chip Architecture",2nd Edition, Addison Wesley, 2000.

<table>
<tr><td>Course Title</td><td colspan="4">Digital Logic Circuits & Design</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005404</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To study the basic philosophy underlying the various number systems, Complements and binary codes.
● To study the theory of Boolean algebra and acquire the skills to manipulate and examine Boolean algebraic expressions.
● To study the design principles of combinational and sequential circuits.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Recall Binary Number systems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand Boolean algebra and apply to the Boolean functions.</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply different optimization techniques to construct effective logic circuit.</td></tr>
<tr><td>CO 4</td><td colspan="8">Develop digital systems using combinational and sequential logic to solve engineering problems.</td></tr>
<tr><td>CO 5</td><td colspan="8">Illustrating different registers, counters, Memory Concepts.</td></tr>
</table>

UNIT-I

BINARY SYSTEMS: Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Error detection and Correction, Binary codes.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic Gates.

UNIT-II

GATE-LEVEL MINIMIZATION: The map method, Four-variable map, Five-variable map, Product of sums(POS) simplification , Don't-Care conditions, NAND and NOR implementation, Other Two-level implementations, Exclusive –OR function.

UNIT-III

COMBINATIONAL LOGIC: Combinational Circuits, Analysis of Combinational circuits, Design procedure, Code -converters, Binary adder-subtractor, Decimal Adder, Binary multiplier, Magnitude -comparator, Decoders, Encoders, Multiplexers.

UNIT-IV

SEQUENTIAL LOGIC: Sequential circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design of Synchronous sequential circuits.

UNIT-V

REGISTERS AND COUNTERS: Registers, Shift Registers, Ripple counters, synchronous counters, Ring counter and Johnson counter.

MEMORY AND PROGRAMMABLE LOGIC: Random-Access memory, Read-Only memory, Programmable Logic Array, Programmable Array Logic.

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6th edition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

<table>
<tr><td>Course Title</td><td colspan="4">Probability Theory And Statistical Methods</td><td colspan="4">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2021405</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To help the students in getting a thorough understanding of the fundamentals of probabilities.
● To help the students in getting a thorough understanding and usage of statistical techniques like testing of hypothesis and statistical control.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the concepts of Probability and random variables.</td></tr>
<tr><td>CO 2</td><td colspan="8">Interpret the properties of probability distributions and their applications.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze the problems of engineering and industry using the techniques of testing of hypothesis for large samples.</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze the problems of engineering and industry using the techniques of testing of hypothesis for small samples.</td></tr>
<tr><td>CO 5</td><td colspan="8">Apply statistical quality control and draw appropriate inferences for engineering problems.</td></tr>
</table>

<u>UNIT-I</u>

Random variables: Discrete random variables – Continuous random variables – Probability distribution function – Discrete and continuous probability distribution – Mathematical Expectation, Variance and standard deviation of probability distribution.

<u>UNIT-II</u>

Discrete distributions: Binomial and Poisson distributions with related properties.

Continuous distributions: Uniform and Normal distributions with related properties.

<u>UNIT-III</u>

Testing of Hypothesis: Formulation of null hypothesis, critical regions, level of significance. Large sample tests. Tests based on normal distribution – z -test for means and proportions.

<u>UNIT-IV</u>

Small samples: t-test for one sample, two samples problems and paired t-test. F-test – Chi-square test (testing of goodness of fit and independence).

UNIT-V

Statistical Quality Control: Concept of quality of a manufactured product – defect and defectives – Causes of variation – Random and assignable causes – The principle of Shewhart control chart – Charts for attributes and variable quality characteristics – Construction and operation of X-bar chart and R-chart, p-chart and c-chart.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna Publishers-44 edition.
2. Probability and Statistics for Engineers and Scientists, Walpole and Myers, Seventh edition, Pearson Education Asia, 2002
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013.
4. An Introduction to Probability theory and its applications, William Feller

Reference Books:

1. Probability and Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publishers.
2. Statistical Methods by S.P.Gupta, S Chand Publications, 44th revised edition 2014.
3. Probability and Statistics for Engineers, Johnson, Fifth edition, Prentice Hall of India.
4. Probability & Statistics, Mendenhall Beaver, Beaver.

<table>
<tr><td>Course Title</td><td colspan="5">Microprocessors
&
Microcontrollers Lab</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2014406</td><td rowspan="2">ESC Lab</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To write 8086microprocessor and 8051 microcontroller programs for various operations
● Learning interfacing of processor with various Peripherals</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Develop algorithm and assembly language programs to solve problems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze abstract problems and apply a combination of hardware and software to address the problem.</td></tr>
<tr><td>CO 3</td><td colspan="8">Choosing an appropriate algorithm, program and peripheral for the application.</td></tr>
<tr><td>CO 4</td><td colspan="8">Design the microprocessor based system to solve real time problems.</td></tr>
</table>

General Programs

1. Addition and Subtraction of two 8- bit/16 bit numbers, Multiplication of two 8-bit & two 16-bit numbers, Division of 16-bit by 8-bit and 32-bitby 16-bit number
2. Addition and Subtraction of 6 data bytes with 6-data bytes of another location.
3. Check the given Number is even or odd, Counting of 0’s and 1’s in a given data,

   Check the given number is logical palindrome or not.
4. Finding the maximum and minimum numbers in a given string of data.
5. Sorting the given numbers in ascending and descending order.
6. Finding the Factorial and Generating Fibonacci Series.
7. Conversion of BCD to hexadecimal number, Multiplication of two 3x3 matrices.
8. Addition, Subtraction, Multiplication, Division using Microcontroller.

Interfacing

1. Dual DAC interface (waveform generation).
2. Stepper motor control.
3. Display of flags using logic controller.
4. Traffic light controller.

Text Books:

1. Ramesh S. Gaonkar, “Microprocessor architecture, programming and its applications with 8085”, Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, “The 8051Microcontroller and Embedded Systems”, 2nd Edition, Pearson Education, 2008.
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1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, “The Intel Microprocessors-Architecture, Programming and Interfacing”, 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, “Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design”, 2nd Edition, PHI.
4. Raj Kamal,“Microcontrollers Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.
5. Steve Furbur, “ARM System on-chip Architecture”,2nd Edition, Addison Wesley, 2000.

<table>
<tr><td>Course Title</td><td colspan="5">Principles of Operating Systems lab</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005407</td><td rowspan="2">PCC Lab</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks
- Have a thorough knowledge on paging and segmentation concepts

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Design, implement and analyze the various process scheduling algorithms and process synchronization mechanisms
CO 2	Understand, implement and analyze the various memory management schemes.
CO 3	Design, implement and analyze the ways to deal the deadlocks in the system.
CO 4	Understand and analyze the paging and segmentation schemes.
CO 5	Understand and analyze the File Allocation Techniques.

List of Sample Experiments:

1. Write a C/C++ program to simulate the following CPU scheduling algorithms to find the average turnaround time and average waiting time of process.
   (a) First Come First Serve
   (b) Shortest Job First
   (c) Priority
   (d) Round Robin Scheduling

2. Write a C/C++ Program to simulate Producer Consumer Problem.

3. Write a C program to simulate the concept of Dining-Philosophers problem.

4. Write a C/C++ program to simulate the following contiguous memory allocation techniques
   a) First Fit b) Best Fit c) Worst Fit

5. Write a C/C++ program to simulate the following page replacement algorithms to find the total number of page faults for given page reference string.
   (a) First in First out
   (b) Least Recently Used
   (c) Optimal

6. Write a C/C++ program to simulate the paging and segmentation concepts.

7. Write a C program to simulate the following
   a) Deadlock avoidance b) Deadlock detection

8. Write a C/C++program to simulate the following file allocation
   a) Sequential b)Indexed c)Linked

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”, Eighth edition, John Wiley.
2. Andrew S Tanenbaum, “Modern Operating Systems”, Fourth Edition, Pearson Education
3. William Stallings, “Operating Systems: Internals and Design Principles”, Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, “Operating Systems, A Concept based Approach”, Third Edition, TMH

Reference Books:

1. A.S.Godbole, “Operating Systems”, Second Edition, TMH.\
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

<table>
<tr><td>Course Title</td><td colspan="5">Digital Logic Design Lab</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005408</td><td rowspan="2">PCC Lab</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To study the theory of Boolean algebra and acquire the skills to manipulate and examine Boolean algebraic expressions.
● To study the design principles of combinational and sequential circuits.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Apply knowledge of binary systems, logic gates and Boolean functions to minimize and implement digital logic circuit.</td></tr>
<tr><td>CO 2</td><td colspan="8">Design digital logic circuit using combinational and sequential logic to solve engineering problems.</td></tr>
</table>

List of Experiments:

1. Implementation of basic gates with NAND and NOR gates.
2. Implementation of logic circuit for given Boolean Expression.
3. 4-bit Binary adder cum subtractor.
4. BCD to Excess-3 code conversion.
5. Design 3x8 Decoder.
6. Design the following encoders

   A) 8x3 Encoder.

   B)Priority Encoder.
7. Design 16x1 multiplexer using 4x1 multiplexer.
8. Design 4-bit Binary comparator.
9. Design BCD adder.
10. Design 4-bit shift register.
11. Design asynchronous UP/DOWN counter
12. Design

    A) Synchronous UP counter using D-flipflop

    B) Modulo 6 counter

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6th edition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M. Rafiquzzaman John Wiley.

Course Title	Advanced Python Programming/ NASSCOM Courses					B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005409	Skill Oriented Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	1	2	2	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- Python is a very powerful programming language used for many different applications. Over time, the huge community around this open source language has created quite a few tools to efficiently work with Python. The course enables the students to learn various python libraries starting from Numpy arrays, Pandas Data Frames, Matplotlib. Along the way, they'll learn about data cleaning, feature extraction and object oriented concepts using python.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understanding the basic concepts on Numpy arrays and performs calculations on given data.
CO 2	Apply critical pandas concepts to handle the data frames.
CO 3	Apply data visualization using matplotlib packages.
CO 4	Analyze object oriented concepts for data reusability.
CO 5	Use data cleaning methods and feature extraction for data science applications.

List of Experiments:

Week-1: Study and implementation of various Basic Slicing and Advanced Indexing operations of NumPy arrays using Python over example data series?

Week-2: Implement the program using python Aggregations like Min, Max, and etc.?

Example: Consider the heights of all US presidents and find the Average Height of prime ministers of America? This data is available in the file "*president_heights.csv*".

Week-3: Write a python Program using Numpy Comparisons, Masks, and Boolean Logic? Example: Consider the series of data that represents the amount of precipitation each day for a year in a given city and count the Rainy Days.

Week-4: Write a python Program using Numpy Fancy Indexing in single and multiple dimensions by selecting Random Points?

Week-5: Study and implementation of various Pandas operations on

i) Data sets ii) Data Frames iii) Crosstab iv) Group by

v) Filter vi) Missing values

Week-6: Implement the python program using pandas

i) Program to Combining Datasets using Merge.

ii) Program to Combining Datasets using joins.

Week-7: Implement the python program using pandas

i) Program using Pandas on Pivot Tables.

ii) Program using Pandas to Vectorized String Operations.

Week-8: Program using Pandas to Working with Time Series

Example: Visualizing Seattle Bicycle Counts data set.

Week-9: Implement the python program for the following matplotlib features

i) Color bars.

ii) Annotation

iii) Matplotlib to Text.

iv) Histograms

v) Scatter Plots

vi) Box plot

Week 10: Write the python program to implement various sub packages of Scipy.

Week11: Write a Python program to create a parent class and child class along with their own methods. Access parent class members in child class to implement the following sceneries.

a) Constructors & destructors

b) Polymorphism

Example:

Create a class ATM and define ATM operations to create account, deposit, check_balance, withdraw and delete account. Use constructor to initialize members.

Week-12: Implement the various data cleaning steps of example data sets using python nympy and pandas

Week13: Implement the feature selection of data set using appropriate sklearn libraries.

Text Books:

1. Robert Johansson, "Numerical Python: A Practical Techniques Approach for Industry" published by Apress.
2. Daniel Y. Chen, "Pandas for Everyone: Python Data Analysis", First Edition by Addison-Wesley Professional
3. Alvaro Fuentes, "Become a Python Data Analyst" by Packt publishing
4. Paul Barry, "Head First Python a Brain Friendly Guide", O'Reilly, 2nd Edition, 2016.

Reference Books:

1. Advanced Python Programming By Dr. Gabriele Lanaro, Quan Nguyen, SakisKasampalis by Packt publishing
2. Advanced Python Development: Using Powerful Language Features in Real World Applications By Matthew Wilkes ApressJuly 2020
3. Expert Python Programming - Fourth Edition By Michal Jaworski and Tarek ZiadePackt PublishingMay 2021
4. Modern Python Cookbook - Second Edition By Steven F. Lott Packt PublishingJuly 2020.

<table>
<tr><td>Course Title</td><td colspan="4">Universal Human Values</td><td colspan="3">B.Tech CSE IV Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2024410</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">External Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Students are expected to become more aware of themselves, and their surroundings (family, society, nature).
CO 2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO 3	They would have better critical ability.
CO 4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
CO 5	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

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-II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- 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
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal 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-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- 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-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- 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.
- Case studies of typical holistic technologies, management models and production systems
- 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 organizationsSum up.

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 Books:

1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, “Teachers’ Manual for A Foundation Course in Human Values and Professional Ethics”, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.
3. E. FSchumacher. “Small is Beautiful”.
4. Slow is Beautiful –Cecile Andrews

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, “Human Values”, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi “The Story of My Experiments with Truth”
5. J C Kumarappa “Economy of Permanence”
6. Pandit Sunderlal “Bharat Mein Angreji Raj”
7. Dharampal, “Rediscovering India”
8. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
9. India Wins Freedom - Maulana Abdul Kalam Azad
10. Vivekananda - Romain Rolland(English)
11. Gandhi - Romain Rolland (English)

MOE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor’s role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

B.Tech V SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="4">Software Engineering</td><td colspan="3">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005501</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Knowledge of basic Software engineering methods and practices, and their appropriate application also the software engineering layered technology and Process frame work.
- A general understanding of software process models such as the waterfall and evolutionary models.
- Understanding of the role of project management including planning, scheduling, risk management, etc.
- Understanding of data models, object models, context models and behavioural models also different software architectural styles.
- Understanding of software testing approaches such as unit testing and integration testing other testing strategies and Risk management.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Ability to apply software engineering principles and techniques.
CO 2	Ability to develop, maintain and evaluate large-scale software systems.
CO 3	To produce efficient, reliable, robust and cost-effective software solutions.
CO 4	To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

UNIT - I

Software and Software Engineering: The Nature of Software, Software Engineering, Software Process Software Myths. Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models.

UNIT - II

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Requirements Modeling: Requirements Analysis, Scenario-Based Modeling, Data Modeling Concepts, Class-Based Modeling.

UNIT - III

Design Concepts: Design within the Context of Software Engineering, Design Process, Design Concepts, The Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design.

UNIT - IV

User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

Coding and Testing: Testing, Testing in the Large versus Testing in the Small, Unit Testing, Integration Testing, Black-Box Testing, White-Box Testing, Debugging, System Testing.

UNIT - V

Software Project Management: Project Planning, Metrics for Project Size Estimation, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO-A Heuristic Estimation Technique, Halstead‘s Software Science-An Analytical Technique, Risk Management.

Text Books:

1. Software Engineering: A practitioner’s Approach, Roger S. Pressman, Seventh Edition, 2010, McGrawHill International Edition.
2. Fundamentals of Software Engineering, Rajib Mall, 4th Edition, 2014, PHI.
3. Software Engineering, Ian Sommerville, Ninth edition, Pearson education.
4. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008

Reference Books:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
2. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
3. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
4. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition , 2006.
5. Software Engineering Foundations, Yingxu Wang, Auerbach Publications,2008.

<table>
<tr><td>Course Title</td><td colspan="4">Design And Analysis of Algorithms</td><td colspan="3">B.Tech CSE V Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005502</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To understand and apply the algorithm analysis techniques.
● To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
● To understand different algorithm design techniques.
● To understand the limitations of Algorithmic power.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Prove the correctness and analyze space and time complexity of an algorithm.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand different algorithm design strategies.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze & Apply standard algorithms.</td></tr>
<tr><td>CO 4</td><td colspan="8">Understand Graph/Tree bases applications and appropriate techniques.</td></tr>
<tr><td>CO 5</td><td colspan="8">Current trends in Non Deterministic concepts.</td></tr>
</table>

UNIT-I

Introduction: What is an algorithm? Algorithm Specification, **Performance Analysis**: Space complexity, Time Complexity**. Asymptotic Notations**: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), **Brute Force Method:** Sequential Search, Selection Sort, Bubble Sort.

UNIT-II

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's Matrix multiplication.

Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines. **Minimum cost spanning trees:** Prim's Algorithm, Kruskal's Algorithm.

UNIT-III

Dynamic Programming: General method, Multistage Graphs, All Pairs Shortest Paths, Single Source Shortest Path, Optimal Binary Search Trees,0/1Knapsack problem, Travelling Sales Person problem .

UNIT-IV

Search and Traversal techniques: Techniques for Binary tree, Technique for Graphs, connected components and spanning tree, Bi connected components.

Backtracking: General method, N-Queens problem, Sum of sub sets problem, Graph coloring, Hamiltonian cycles.

UNIT-V

Branch and Bound: Travelling Sales Person problem, 0/1Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-Complete and NP-Hard problems: Basic concepts, non-deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran,"Fundamentals of Computer Algorithms", Galgotia Publications.
2. Levitin, Anany." Introduction to the design & analysis of algorithms**"** Pearson Education, 2008.
3. Udit Agarwal," Algorithms Design and Analysis",Dhanpath Rai & Co,2017.
4. Sedgewick Robert and Kevin Wayne, "Algorithms" , Pearson Education, Fourth Edition.
5. Parag H.Dave Himanshu B.Dave "Design and Analysis of Algorithms" Pearson Education 2008.

Reference Books:

1. Aho, Hopcroft, Ulman,"the Design and Analysis of Computer Algorithms" Pearson Education, 2000.
2. Steven S.Skiena," The Algorithm Design Mannual", Spingers, Third Edition.
3. R.L.Rivest and C.Stein" Introduction to Algorithms",Second Edition, Pearson Education
4. M.T.Goodrich and R.Tomassia, John Wiley and sons," Algorithm Design: Foundations, Analysis and Internet examples".
5. Sanjoy Dasgupta, Christos H Papadimitriou, Umesh Virkumar Vazirani, "Algorithms" , McGraw-Hill Higher Education, 2008.

<table>
<tr><td>Course Title</td><td colspan="5">Computer Networks</td><td colspan="3">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005503</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Study the evolution of computer networks and future direction.
- Study the concepts of computer networks from layered.
- Perspective study the issues open for research in computer networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the terminology and concepts of the OSI reference model and TCP-IP.
CO 2	Describe the functions of Data link layer and its protocols.
CO 3	Classifying the different routing algorithms and IP addressing with network layer
CO 4	Understand connection establishment and services provides by TCP and UDP.
CO 5	Explain the working of DNS and World Wide Web.

UNIT - I

Introduction: Uses of Computer Networks, Network Hardware, Reference Models: OSI, TCP/IP, Comparison of OSI & TCP/IP reference models.

Introduction to physical layer: Data and Signals, Transmission impairment, Datarate limits, Performance.

Transmission media: Introduction, Guided Media, Unguided Media.

Switching: Introduction, Circuit Switched Networks, Packet Switching.

UNIT - II

The Data Link Layer: Data Link Layer design issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols.

The Medium Access Control sublayer : Multiple Access protocols, Ethernet, Data Link Layer Switching.

UNIT - III

The Network Layer: Network layer design issues, Routing algorithms : The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Anycast Routing,

Congestion control algorithms, Quality of service, IP Addresses, IPv4,IPv6,Tunneling, Fragmentation.

UNIT - IV

The Transport Layer: The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP: Introduction to TCP, Service Model, Protocol, Segment Header, Connection Establishment, Connection Release.

UNIT - V

The Application layer: Domain Name System (DNS), World Wide Web (WWW), E-mail.

Text Books:

1. "Computer Networks", Andrew S. Tanenbaum, David J.Wetherall, Pearson, 5th edition, 2010.
2. "Data communications and networking", Behrouz A. Forouzan, TMH, 5th edition, 2012.
3. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1, Douglas E. Comer, 5th edition, PHI
4. "Computer Networks", 5E, Peterson, Davie, Elsevier.

Reference Books:

1. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
2. "Computer Networks and Internets with Internet Applications", Comer.
3. Computer Networks, A Top-Down Approach, James F. Kurose, Keith W. Ross, 3rd Edition, Pearson.
4. Computer Networks, A Top-Down Approach, Behrouz A. Forouzan, Firoz Mosharraf, Special Indian Edition, McGraw Hill.

Course Title	**Disaster Management**					**B.Tech CE V Sem (R20)**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE101	**Open Elective (OEC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Objectives:

To make the student to provide basic conceptual understanding of disasters and its relationships with planning management.
To make the student to gain an understanding of the scope and extent to which natural and manmade disasters influence vulnerability profile of India.
To make the student able to relate disasters impact on social, economic and political environment.
To make the students to understand approaches of Disaster Risk Reduction and the relationship between vulnerability, disasters, disaster prevention and risk reduction.
To make the student able to enhance awareness of Disaster Risk Management and build skills to respond at disasters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define and describe the terminology used within disaster planning and Management.
CO 2	Understand the scope, extent, and complexity of natural and man-made disasters.
CO 3	Justify the knowledge gained from disaster impacts on health, psycho-social issues and demographic aspects
CO 4	Discuss effective means to plan, mitigate, respond, and recover from disasters and emergencies, natural and man-made
CO 5	Understand the problems associated with government collaboration and assistance to state and local governments and non-governmental organizations.

UNIT-I

Introduction

Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT – II

Disasters

Disasters classification; natural disasters: floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.; manmade disasters: industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.; hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT – III

Disaster Impacts

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT – IV

Disaster Risk Reduction (DRR)

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); sustainable and environmental friendly recovery; reconstruction and development methods.

UNIT – V

Environment and Development

Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni and Madhavi Ariyabandu, "Disaster Risk Reduction in South Asia", PHI Learning Pvt. Ltd., Delhi.
2. B. K. Singh, "Handbook of Disaster Management: Techniques and Guidelines", Rajat Publications, Delhi.
3. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC.
4. Inter-Agency Standing Committee (IASC) (Feb. 2007) IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Reference Books:

1. G. K. Ghosh, "Disaster Management", APH Publishing Corporation, New Delhi.
2. http://ndma.gov.in/ (Home page of National Disaster Management Authority.
3. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
4. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.

Course Title	Basics of Civil Engineering					B.Tech CE V Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE102	**Open Elective (OEC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Objectives:
To include the essentials of civil engineering field to the students of all branches of Engineering
To provide the students an illustration of the significance of the civil engineering profession in satisfying social needs.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Illustrate the fundamental aspects of Civil Engineering.
CO 2	List the components of various types of buildings.
CO 3	Explain the concepts of planning and able to read a building plan.
CO 4	Illustrate the setting out of a building and acquire knowledge on building area items.
CO 5	Discuss about various building materials used for construction.

UNIT-I
General introduction to Civil Engineering
Various disciplines of civil engineering, Relevance of civil engineering in the overall infrastructural development of the country. Introduction to types of buildings as per NBC, selection of sites for buildings.

UNIT – II
Building Components
Components of residential buildings and their functions; Introduction to industrial buildings – office/factory/software development office/power house/electronic equipment service centre.

UNIT – III
Building planning
Introduction to planning of residential buildings- site plan, orientation of a building, open space requirement, position of doors and windows, size of rooms; preparation of a scaled sketch of the plan of a single storeyed residential building in a given site plan.

UNIT – IV
Building area items
Introduction to the various building area items – computation of plinth area / built up area, floor area / carpet area – for a single storeyed building; setting out of a building.

UNIT – V
Building construction
Foundations; Bearing capacity of soil (definition only) - Functions of foundations, Types - shallow and deep (sketches only)

Brick masonry – header and stretcher bond, English bonds – Elevation and Plan (one brick thick walls only)
Roofs – functions, types, roofing materials
Floors – functions, types; flooring materials
Paints and Painting – Purpose, types

Text Books:

1. Gopi, S., “Basic Civil Engineering”, Pearson Publishers
2. S.S Bhavikatti, “Basics civil engineering”, New international publishers
3. Rangwala, S.C and Dalal, K. B., “Building Construction”, Charotar Publishing house
4. Rangwala, S.C., “Essentials of Civil Engineering”, Charotar Publishing

Reference Books:

1. Mckay, W.B. and McKay, J. K., “Building Construction Volumes 1 to 4”, Person India Education Services
2. Minu, S., “Basic Civil Engineering”, Karunya Publication
3. Chudley, R., “Construction Technology, Vol. I to IV”, Longman Group, England
4. Kandya, A. A., “Elements of Civil Engineering”, Charotar Publishing house.

Course Title	Building Materials					B.Tech CE V Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE103	**Open Elective (OEC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Objectives:
The importance and fundamental knowledge of building materials such as stones and aggregates its properties for better construction.
The laboratory, field tests conducted on Bricks and Cement to identify better construction materials with strength & durability.
The ability to understand the properties of Lime and Timber.
Understand various Masonry works used in the construction field.
To study the Modern Engineering materials used in construction.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Aware of natural and manufactured aggregates and the importance of physical properties of aggregates used for building construction.
CO 2	Identify various properties of bricks and steel used in construction of structures.
CO 3	Select appropriate timber and cement materials for different types of constructions.
CO 4	Choose suitable masonry works for modern construction to enhance the elegance and performance.
CO 5	Aware of different modern materials in construction.

UNIT-I

Stones and Aggregates

Properties of building stones – Classification of stones – Stone quarrying, precautions in blasting – Dressing of stone, Fine aggregate: Natural and manufactured – Sieve analysis – Different tests on fine aggregate, Coarse aggregate: Natural and manufactured – Importance of size, shape and texture.

UNIT – II

Bricks

Composition – Types of bricks – Manufacturing process of bricks – Test on bricks – Standard requirements and grades.

Steel

Types and grades of steel, tests on steel, applications.

UNIT – III

Cement

Introduction – Chemical Composition – Types of cement with their specific uses – Grade of cement as per BIS – Engineering properties of cement – Field and Laboratory test of cement as per BIS.

Timber

Types of timber – Uses and application of timber – Defects in timber and wood – Seasoning Wood – Wood products with specific uses

UNIT – IV

Masonry Works

Masonry - Stone Masonry - Rubble Masonry - Brick Masonry - Bond - Types of bonds - English and Flemish bonds - Composite masonry - Concrete Masonry - Reinforced masonry - Types of walls - Types of Partition walls.

UNIT – V

Modern Building Materials

Aluminum – Fiber Reinforced Polymers – Ferro cement – Composite materials – Light Weight Roofing

Materials – GI Sheets – Ceramics – Other Modern Materials.

Text Books:

1. Rajput R.K. “Engineering Materials”, S. Chand & Company Ltd. New Delhi, Third Edition2009.
2. P C Varghese, “Building Materials”, PHI Learning Pvt. Ltd., Delhi.
3. G C Sahu, Joygopal Jena, “Building Materials and Construction”, McGraw hill Pvt Ltd 2015.
4. Arthur Lyons De, “Materials for Architects and Builders”, Montfort University, Leicester, UK.

Reference Books:

1. S C Rangwala, “Engineering Materials”, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
2. S K Duggal, “Building Materials”, New Age International (P) Limited, Publishers, New Delhi.
3. S. C. Rangwala, “Building Construction”, Charotar Publishing House Pvt. Ltd., Anand, Gujarat.
4. R. Chubby, “Construction Technology – Vol – I & II”, Longman UK

<table>
<tr><td>Course Title</td><td colspan="4">Modern Control Theory</td><td colspan="3">B. Tech. EEE
Open Elective - 1</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE201</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: Students are able to learn the State Space, Describing function, phase plane and stability analysis including controllability and observability.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the concept of State Space Techniques</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze the stability of linear and nonlinear Systems</td></tr>
<tr><td>CO 3</td><td colspan="8">Construct the state model of Linear Time Invariant systems and Lyapunov functions for nonlinear systems</td></tr>
<tr><td>CO 4</td><td colspan="8">Determine Eigen values state transition matrix and examine the controllability and observability of linear time invariant systems</td></tr>
<tr><td>CO 5</td><td colspan="8">Design state feedback controller and observer</td></tr>
</table>

UNIT – I

State variable descriptions: Concepts of state, state variables, state vector, state space model, representation in state variable form, phase variable representation.

UNIT – II

Solution of State Equations: diagonalization –state transition matrix – properties - .solution of state equations of homogeneous and non-homogeneous systems.

UNIT – III

Controllability and Observability: Definition of controllability – controllability tests for continuous linear time invariant systems – Definition of observability – observability tests for continuous linear time invariant systems,

UNIT – IV

Design of Control Systems: Introduction, Pole placement by state feedback, Full order and reduced order observers,

UNIT – V

Stability: Introduction, equilibrium points – stability concepts and definitions – stability in the sense of Lyapunov - stability of linear system – methods of constructing Lyapunov functions For non-linear system : Krasovskii's method – Variable gradient method.

Text Books

1. Modern Control System Theory by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. Control System Engineering by I. J. Nagarath and M. Gopal, New Age International (P) Ltd.

Reference Books

1. Modern Control Engineering by K. Ogata, Prentice Hall of India, 3rd Edition, 1998.
2. Systems and Control by Stainslaw, H. Zak, Oxford Press, 2003.
3. Digital Control and State Variable Methods by M. Gopal, TMH, 1997.

<table>
<tr><td>Course Title</td><td colspan="4">Programming Fundamentals for Numerical Computations</td><td colspan="3">B. Tech. EEE
Open Elective - I</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE202</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The main objective of the course is to make the students familiar with scripts, functions, control flow and plotting and use them to solve various engineering problems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand basic features, arrays and symbolic algebra.</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze various control flow structures, interpolation and curve fitting</td></tr>
<tr><td>CO 3</td><td colspan="8">Solve linear equations, Polynomials</td></tr>
<tr><td>CO 4</td><td colspan="8">Plot two-dimensional and three-dimensional graphics</td></tr>
</table>

UNIT-I

Basics Fundamental Features: Basic features, script M-files, code cells, arrays creation, addressing and array operations; multi-dimensional arrays.

UNIT-II

Control Flow: Arithmetic & Logical operators, control flow - if, if-else, for, while, switch case constructions and functions.

UNIT-III

Mathematical Operations: Matrix algebra and solutions to systems of linear equations, polynomials, Numerical integration, numerical differentiation

UNIT-IV

Graphics & Numerical techniques: Two-dimensional graphics, basics of three-dimensional graphics, interpolation, curve fitting.

UNIT-V

Symbolic Mathematics: Symbolic algebra, equation solving, differentiation and integration.

Text Books

1. Hanselman and Littlefield, "Mastering MATLAB 7", Pearson Education Etter,
2. Kuncickly, Hull, "Introduction to MATLAB 6", Pearson Education.

<table>
<tr><td>Course Title</td><td colspan="4">Introduction to Hybrid and Electrical Vehicles</td><td colspan="3">B.Tech ME V Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE301</td><td rowspan="2">OEC-I</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Provide good foundation on hybrid and electrical vehicles.
- To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles.
- Familiarize energy storage systems for electrical and hybrid transportation.
- To design and develop basic schemes of electric vehicles and hybrid electric vehicles.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use working of hybrid and electric vehicles.
CO 2	Choose a suitable drive scheme for developing an hybrid and electric vehicles depending on resources.
CO 3	Develop the electric propulsion UNIT and its control for application of electric vehicles
CO 4	Choose proper energy storage systems for vehicle applications.
CO 5	Design and develop basic schemes of electric vehicles and hybrid electric vehicles.

UNIT – I

Electric Vehicle Propulsion And Energy Sources

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge , specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

UNIT – II

Electric Vehicle Power Plant And Drives

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives- PWM, current control method. Switch reluctance machine drives - voltage control, current control.

UNIT – III

Hybrid And Electric Drive Trains

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies.Hybrid traction and electric traction. Hybrid and electric drive train topologies.

Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

UNIT - IV

Electric And Hybrid Vehicles - Case Studies

Parallel hybrid, series hybrid -charge sustaining, charge depleting.Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev.Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles.

UNIT – V

Electric And Hybrid Vehicle Design

Introduction to hybrid vehicle design.Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem.Energy management strategies in hybrid and electric vehicles - energy management strategies- classification, comparison, implementation.

Text Books:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 2/e, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, AvestaGoodarzi, Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach, illustrated edition, John Wiley & Sons, 2014.
3. MehrdadEhsani, YimiGao, 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. John G. Hayes, G. AbasGoodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles, 1/e, Wiley-Blackwell, 2018

<table>
<tr><td>Course Title</td><td colspan="5">Rapid Prototyping</td><td colspan="3">B. Tech. ME V Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE302</td><td rowspan="2">OEC-I</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.

Train Various Pre – Processing, Processing and Post Processing errors in RP Processes

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use techniques for processing of CAD models for rapid prototyping.
CO 2	Implement fundamentals of rapid prototyping techniques.
CO 3	Choose appropriate tooling for rapid prototyping process.
CO 4	Create rapid prototyping techniques for reverse engineering.
CO 5	Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

UNIT - I

Introduction to RP Introduction

Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

RP Software: Need for RP software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, SolidView, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.

UNIT - II

Solid and Liquid Based RP Systems

Solid and Liquid Based RP Systems: Stereolithography (SLA): Principle, Process, Materials, Advantages, Limitations and Applications. Solid Ground Curing (SGC): Principle, Process, Materials, Advantages, Limitations, Applications. Fusion Deposition Modeling (FDM): Principle, Process, Materials, Advantages, Limitations, Applications. Laminated Object Manufacturing (LOM): Principle, Process, Materials, Advantages, Limitations, Applications.

UNIT - III

Powder Based RP Systems **Powder Based RP Systems**

Principle and Process of Selective Laser Sintering (SLS), Advantages, Limitations and Applications of SLS, Principle and Process of Laser Engineered Net Shaping (LENS), Advantages, Limitations and Applications of LENS, Principle and Process of Electron Beam Melting (EBM), Advantages, Limitations and Applications of EBM.

Other RP Systems: Three Dimensional Printing (3DP): Principle, Process, Advantages, Limitations and Applications. Ballastic Particle Manufacturing (BPM): Principle, Process, Advantages, Limitations, Applications. Shape Deposition Manufacturing (SDM): Principle, Process, Advantages, Limitations, Applications.

UNIT - IV

Rapid Tooling

Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.

Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT – V

Errors in RP Processes

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS, etc.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Text Books:

1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" Fifth Edition, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, Second Edition, 2010.

Reference Books:

1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.

<table>
<tr><td>Course Title</td><td colspan="5">Design for Manufacturing and Assembly</td><td colspan="3">B.Tech ME V Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE303</td><td rowspan="2">OEC-I</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Discuss various factors influencing the manufacturability of components and use of tolerance s in manufacturing
- Explain various considerations in casting, welding, forging and machining processes.
- Demonstrate on the design factors dependent on the assembly methods.
- Teach the principles and rules of design for assembly.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the importance of Design for Manufacturing and Assembly.
CO 2	Examine the form design factors with the help of Case study.
CO 3	Evaluate how the factor of redesign affects the product life cycle.
CO 4	Make use of DFA methods proposed by Boothroyd and Dewhurst.
CO 5	Analyse the importance of Design for Manufacturing and Assembly.

UNIT - I

Introduction to DFM

Significance of design, qualities of a designer and Design factors, Systematic working plan, The engineering problem to be solved, The basic design, Factors influencing choice of materials and the factors influencing manufacturing Process Capability Mean, Median, Variance, Mode, Standard Deviation, Normal Distribution and Process capability metrics, Process Capability, Tolerances-symbols and definition, Tolerances relevant to manufacturing, assembly and material condition, Tolerance stack-effects on assembly with examples, Methods of eliminating tolerance stack with examples.

UNIT - II

Form Design-Casting and Welding

Influence of loading, Materials, Production methods on form design, Casting considerations, Grey iron castings, Steel castings, Aluminum Casting Requirements and rules for casting, Form design of pressure die castings, Welding considerations welding Processes, Requirements and rules for welding, Redesign of components for casting-pattern-mould- Parting Line, Redesign of components for welding, Case studies in form design-simple problems in form design

UNIT – III

Form Design-Forging and Machining

Forging considerations hammer forging drop forging, Requirements and rules for forging, Choice between casting, forging and welding, Machining considerations Drills, Milling-Keyways, Dwells and Dwelling

Procedure Countersunk Head screws Requirements and rules for Machining considerations and Reduction of machined areas Redesign of components for Forging, Redesign of components for Machining, Simplification by separation and Simplification by amalgamation, Case studies.

UNIT - IV

Introduction to DFA

DFA, Introduction, Distinction between assembly methods and processes, Factors Determining assembly methods and processes, Success and failure-Causes of failure, Product Design factors independent of methods and processes , Introduction-Number of operations in the product, Assembly Precedence, Standardization, Design factors dependent on Assembly methods , Introduction-Single Station Assembly Line Assembly, Hybrid Systems, Manual Assembly lines, Flexible Assembly lines, Design factors dependent on Assembly processes, Factors Influencing Production rate to Facility Ratio- Parts Presentation, Manual Assembly, Dedicated Assembly, Transportation, Separation and Orientation-Flexible Assembly, Gripping, Transferring, Part Insertion, Failures and Error Recovery.

UNIT - V

Design For Assembly Methods

Approaches to design for assembly and Introduction, Approaches based on design principles and rules, Example DFA method using Design Principles, DFA Systems employing Quantitative evaluation procedures, IPA Stuttgart Method, DFA Methods employing a Knowledge based approach, Knowledge representation Computer Aided DFA methods, Part model, Feature, Processing. Assembly measures like Qualitative and Quantitative measures, Boothroyd and Dewhurst DFA method. Redesign of a simple product , Small consumer product and Fastener solution redesign using symmetry, Case Studies Designing of a disposal valve, Design of a lever-arch file mechanism.

Text Books:

1. Harry Peck., "Design for Manufacture", Pittman Publications, 1983.
2. Alan Redford and chal, "Design for Assembly-Principles and Procedures", McGraw Hill International Europe, London, 1994.

Reference Books:

1. RobertMatousek, "Engineering Design A Systematic Approach", Blackie &sons Ltd., 1963.
2. James G.Bralla, "Hand Book of Product design for Manufacturing", McGraw Hill Co., 1986.
3. Swift, K.G., "Knowledge Based Design for Manufacture", Kogan Page Ltd., 1987

<table>
<tr><td>Course Title</td><td colspan="4">Energy Systems in Engineering</td><td colspan="4">B.Tech ME V Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE304</td><td rowspan="2">OEC-I</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The students completing this course are expected:

- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- Explain renewable energy sources; characteristics, working principle, classify types, layouts, and plant operations.
- Impart types of nuclear power plants, and outline working principle and advantages and hazards.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe working components of a steam power plant.
CO 2	Understand the various elements of hydroelectric power plant and their types.
CO 3	Illustrate the working mechanism of Nuclear and Gas turbine power plants.
CO 4	Summarize types of renewable energy sources and their working principle.
CO 5	Analize power plant economics, and environmental aspects.

UNIT – I

Introduction to different Sources of Energy.

STEAM POWER PLANT: Layout of Modern Steam Power Plant, working of different circuits- selection of site- Coal Storage- Classification of coal handling and Ash handling systems.

UNIT – II

HYDRO ELECTRIC POWER PLANT: Selection of Site for Hydro Electric Power Plant – Hydrological cycle – Hydrographs - flow duration curve - mass curve – classification of dams, spill ways and surge tanks.

HYDRO PROJECTS AND PLANT: Classification of Hydro Electric Power Plants – Typical layout – plant auxiliaries – plant operation - pumped storage plants.

UNIT – III

NUCLEAR POWER PLANT: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast Breeder Reactor, Homogeneous Reactor and Gas Cooled Reactor - Radiation hazards and shielding –radioactive waste disposal.

GAS TURBINE POWER PLANT: Introduction – Plant Layout – Classification – Working of

Simple Gas Turbine Power Plant– Constant pressure and constant volume Gas Turbine Power Plants –Combination of GasTurbine Cycles.

UNIT- IV

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar- Collectors-Principle of Working, Wind Energy– types – HAWT, VAWT -Tidal Energy.

Direct energy conversion: Solar energy, Fuel cells, MHD generation.

UNIT – V

POWER PLANT ECONOMICS: Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor, utilization factor, Plant capacity factor and plant use factor - Types of loads -Load curve and load duration curve - general arrangement of power distribution

Different types of tariff for Electrical energy –Cost of generation and fixed cost, semi fixed cost, running cost, depreciation methods, and straight line methods Simple problems.

Text Books:

1. P.K. Nag, Power Plant Engineering, 3/e, TMH, 2013.
2. Arora and S. Domkundwar, A course in Power Plant Engineering, DhanpatRai& Co (P) Ltd, 2014

Reference Books:

1. Rajput, A Text Book of Power Plant Engineering, 4/e, Laxmi Publications, 2012.
2. Ramalingam, Power plant Engineering, Scietech Publishers, 2013
3. P.C. Sharma, Power Plant Engineering, S.K. Kataria Publications, 2012

<table>
<tr><th>Course Title</th><th colspan="5">Smart Materials</th><th colspan="3">B.Tech ME V Sem</th></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">20OE305</td><td rowspan="2">OEC-I</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Introduce the students with HBLS and LBHS smart materials.
- Expose the students in smart systems development and uses.
- Understand the working principle of smart actuators and smart sensors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyse the role of smart materials in development of intelligent systems and adaptive structures.
CO 2	Compare polycrystalline and single crystal piezoelectric materials
CO 3	Identify the influence of stress on characteristic temperatures in SMA and EAP
CO4	Evaluate the role of smart materials in development of intelligent systems and adaptive structures.
CO 5	Develop of various sensors.

UNIT - I

Introduction to Smart Materials

Introduction to Smart Materials: What is Intelligence? Artificial intelligence Vs. embedded Intelligence, Definition of smart material, need for smart materials, classifications of smart systems, components of a smart systems, smart system applications, the role of Smart Materials in developing Intelligent Systems and Adaptive Structures.

UNIT - II

High bandwidth - Low strain generating (HBLS) Smart Materials

Piezoelectric Materials – constitutive relationship, electromechanical coupling coefficients, piezoelectric constants, piezoceramic materials, variation of coupling coefficients in hard and soft piezoceramics, polycrystalline vs single crystal piezoelectric materials, polyvinyldene fluoride, piezoelectric composites. Magnetostrictive Materials – constitutive relationship, magneto-mechanical coupling coefficients, Joule Effect, Villari Effect, Matteuci Effect, Wiedemann effect, Giant magnetostriction in Terfenol-D, Terfenol-D particulate composites, Galfenol and Metglas materials.

UNIT - III

Low bandwidth - High strain generating (LBHS) materials

Low bandwidth - High strain generating (LBHS) materials: Shape Memory Alloys (SMA) – Introduction, Phenomenology, Influence of stress on characteristic temperatures, Modelling of shape memory effect. Vibration control through shape memory alloys. Design considerations, multiplexing embedded NiTiNOL actuators. Electro-active Polymers (EAP)- Introduction, Phenomenology, Influence of stress on characteristic temperatures.

UNIT - IV

Smart actuators

Based on HBLS smart materials: Piezoelectric Actuators – Induced Strain actuation model, Unimorph and Bimorph Actuators, Actuators embedded in composite laminate, Impedance matching in actuator design, Feedback Control, Pulse Drive, Resonance Drive. Magnetostrictive Actuators – Magnetostrictive Mini Actuators, Thermal instabilities, Discretely distributed actuation, Manetostrictive Composites.

Based on LBHS Smart Materials - Shape Memory Alloy based actuators for Shape Control, Electro-active Polymers for Work-Volume Generation.

UNIT - V

Smart sensors:

Sensors based on HBLS Smart Materials - Piezoelectric Sensors Magnetostrictive Sensors Techniques of Self Sensing MEMS Sensors.

Sensors based on LBHS Smart Materials - EAP based sensors, SMA based encoders, Optical Fibre based Sensing.

Text Books:

1. M.V. Gandhi, B.D. Thompson" Smart Materials and Structures" Springer Science & Business Media, 31-May-1992.

Reference Books:

1. Brian Culshaw, Smart Structures and Materials, Artech House, 2000.
2. Gauenzi, P., Smart Structures, Wiley, 2009.

Course Title	Overview of Microcontrollers					**Open Electives**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE401	**OE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**			

Course Objectives:
To become familiar with 8051, MSP 430, PIC and ARM controllers.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the types of Microcontrollers.
CO 2	Define various components and list out various features of microcontrollers.
CO 3	Describe the various blocks of 8051, MSP 430, PIC and ARM microcontrollers

UNIT I
Introduction: Microcontrollers, Vonneumann Vs Harvard, CISC vs RISC, Types of Microcontrollers, Examples of Microcontrollers, Selection of a microcontroller, Microcontroller resources, Applications.

UNIT II
The 8051 Architecture: Introduction, architecture of 8051, pin diagram, internal RAM memory organization, Special Function Registers, external memory interfacing-ROM & RAM, stack, timers and interrupts.

UNIT III
MSP 430 Microcontroller: The Outside View—Pin-Out, The Inside View—Functional Block Diagram, Memory, Central Processing Unit, Memory-Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets.

UNIT IV
PIC Microcontrollers: Overview and Features, Architecture Details of PIC 16C6X/7X, I/O Ports, Interrupts, Timer, ADC, Features of 16F8XX series.

UNIT V
ARM Architecture: RISC Design philosophy, ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table.

Text Books:
1. Raj Kamal, “Microcontrollers - Architecture, Programming, Interfacing and System Design”- Second Edition, Pearson, 2012.
2. John H Davis, “MSP 430 Microcontroller Basics”, Newnes publishers, 2008.
3. Andrew N.Sloss, Dominic Symes, Chris Wright “ARM System Developer’s Guide-Designing and Optimizing system software”, Elsevier, 2008.
4. Ajay V Deshmukh, “Microcontrollers: Theory and Applications”, TMH, 2005.
Reference Books:
1. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, *The 8051Microcontroller and Embedded Systems,* 2nd Edition, Pearson Education, 2008.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

Course Title	Industrial electronics					Open Electives		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE402	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:
To understand working of semiconductor devices.
To gain the knowledge of AC to DC, AC to AC and DC to DC converters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basics of Power Electronics.
CO 2	Learn the details of power semiconductor switches (Construction, Characteristics and operation)
CO 3	Understand the working of various types of converters.
CO 4	Learn how to analyze the converters and design the components of them, under various load types.
CO 5	Learn about the control of various converters

Unit-I
Power Semiconductor devices: Constructional features, Operating Principle, Characteristics and specification of power semiconductor diode, Power Bipolar Junction transistor (BJT), Thyristors and Triacs, Gate Turn off Thyristors (GTO), Metal oxide semiconductor field effect transistor (MOSFET), Insulate Gate Bipolar transistor (IGBT), Hard and soft switching of Power semiconductors.

Unit-II
AC to DC Convertors: Single Phase uncontrolled rectifier, Single Phase fully controlled rectifier, single phase half controlled bridge rectifier, Operation and analysis of three phase fully controlled bridge converter, Operation and analysis of three phase half controlled converter, Effect of source Inductance on the performance of AC to DC converters, Power factor improvement, Harmonic reduction, filter.

Unit-III
DC to DC Converters: Types of basic DC-DC converters, Analysis of Buck converter (DC-DC) circuit, Commutation of thyristor based circuits, Introduction to switched mode power supply (SMPS) circuits, Fly-back type switched mode power supply, Forward type switched mode power supply, Design of transformer for switched mode power supply circuits.

Unit-IV
AC to AC Voltage converter: Three phase AC regulators, Phase angle control in Traic based single Phase AC regulators, Introduction to cyclo converters, three phases to single phase cyclo converters, three phase to three phase cyclo converters, Control circuit for three phase to three phase converter.

Unit-V

Introduction to voltage source Inverters, Analysis of 1-Phase square wave voltage source Inverter, 3-Phase voltage source with square wave output. 3-phase pulse width modulated inverter. Sine PWM and its realization, current source Inverter, Load commutated current source inverter.

Text Books:

1. M. D. Singh and K. B. Khanchandani," Power Electronics".
2. Ned Mohan, Tore M. Undeland, and William P. Robbins,"Power Electronics: Converters, Applications And Design, Media Enhanced (With CD)".
3. John G. Kassakian, Martin F. Schlecht, and George C. Verghese,"Principles Of Power Electronics".

Reference Books:

1. G. K. Mithal , Maneesha Gupta, "Industrial and Power Electronics", Khanna Publishers,1987.
2. George M. Chute, R. D. Chute, "Electronics in Industry", McGraw-Hill School Pub Co, 5th Edition

<table>
<tr><td>Course Title</td><td colspan="4">DATA STRUCTURES
(Open Elective Course – I)</td><td colspan="4">B.Tech. V Sem (R20UG) AI&ML</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE3901</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To develop skills and analyze linear and nonlinear data structures.
- To understand basic concepts about linked lists, stacks, queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting.

Course Outcomes: On successful completion of this course, the students will be able to	
CO1	Understand the variety of abstract data types and data structures.
CO2	Analyze data structures such as linked list, Stacks and Queues.
CO3	Apply and analyze tree traversal algorithms and graph traversal algorithms.
CO4	Organize data in order using various sorting algorithms.

UNIT - I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & Non Linear data structures, **Linear Lists:** Definition, **Arrays:** Definition, **Linked Lists:** SingleLinked List-Definition, Insertion and Deletion operations**,** Doubly Linked List- Definition,Insertion and Deletion operations. **Stacks:** Definition, Array & Linked representations, Operations, Applications.

UNIT – II

Queues: Definition, Array & Linked representations, Operations, Circular Queues &Dequeues.
Trees: Basic terminology, **Binary Trees** - Definition, Properties, Representation, Completeand Full Binary Tree, **Tree Traversal Algorithm:** In order, Preorder and Post order.

UNIT – III

Binary Search Tree (BST): Definition, Operations& Implementations, Indexed BST.
Balanced Search Trees: AVL trees, Red-Black trees & Splay trees.

UNIT - IV

Graphs: Terminology, Representations, **Graph Traversal:** Depth First Search (DFS),Breadth First Search (BFS), Applications of graphs.

UNIT - V

Sorting: Selection, Insertion, Bubble, Heap, Quick Sort, Merge Sort.
Searching: Linear and Binary search.
Hashing: Introduction, Hash Table representation, Hash Functions.

Text Books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGraw Hill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed,Universitiespress.
3. Data Structures using C++, Varsha H.Patil, Oxford University Press.
4. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGraw Hill.
5. Data Structures and Algorithms, G.A.V.Pai, Tata McGraw Hill.

Reference Books:

1. Data Structures, Algorithms and Applications in C++, AnandaRao Akepogu and Radhika Raju Palagiri, Pearson Education.
2. Data Structures and Algorithms in C++, S.Sahni, University Press (India) PrivateLimited,Second Edition.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

Web links:

1. **https://nptel.ac.in/courses/106102064**
2. **https://nptel.ac.in/courses/106103069**

Course Title	OOP THROUGH C++ (Open Elective Course – I)					B.Tech. V Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
20OE3902	PJ	L	T	P	C	ContinuousInternal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Min					End Exam Duration: 3Hrs			

Course Objectives:

- To make the students understand the features of object-oriented design and familiarizethem with virtual functions, templates and exception handling.
- To enable the students solve various engineering problems in C++ programming language.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fundamentals of C++
CO 2	Explain the concept of Tokens and Control Structures.
CO 3	Illustrate the concept of Classes and Objects.
CO 4	Demonstrate the concept of Operator overloading and Inheritance.
CO 5	Understand the concept of Pointers, Virtual functions and Polymorphism

UNIT – I

Principles of Object-Oriented Programming: Object-Oriented Programming Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, Applications of OOP. **Beginning with C++:** Comments, Output Operator, The iostream File, Variables, Input Operator, Cascading of I/O Operators, Structure of C++ program.

UNIT – II

Tokens, Expressions and Control Structures: Tokens, Keywords, Identifiers and Constants, Basic Data Types, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Memory management operators, Manipulators, Control Structures,
Functions in C++: Function Prototyping, Call by reference, Return by reference, Inline Functions, Function Overloading.

UNIT – III

Classes and Objects: Specifying a Class, Defining Member Functions, Memory allocation for objects, Static data members, Static member functions, Arrays of objects, Friendly functions, **Constructors and Destructors:** Constructors, Parameterized constructors, Multiple constructors in aclass, Constructors with default arguments, Copy constructor, Dynamic constructor, Destructors.

UNIT – IV

Operator Overloading: Defining operator overloading, Overloading Unary operators, Overloading Binary operators, Overloading Binary operators using Friends.
Inheritance: Introduction, Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical

Inheritance, Hybrid Inheritance, Virtual base classes, Abstract classes.

UNIT – V

Pointers, Virtual Functions and Polymorphism: this Pointer, Virtual Functions, Purevirtual functions.
Managing Console I/O Operations: Unformatted I/O operations, Formatted console I/O operations.
Templates: Class Templates, Function Templates, Overloading Template functions, Member function Templates.
Exception Handling: Basics of Exception handling, Exception handling mechanism.

Text Books:

1. The Complete Reference C++, Herbert Schildt, TMH 4th Edition.
2. Learning - Computer Science :A Structured Approach Using C++,2nd Ed., Forouzan,Thomson.
3. Object Oriented Programming With C++, E. Balagurusamy, TMH 6th edition.

Reference Books:

1. Object oriented programming with ANSI and TURBO C++, Ashok N Kamathane,Pearson education.
2. Object oriented programming with C++, Saurav Sahay, Oxford.
3. Learning C++ Programming: From Problem Analysis To Program Design, Malik,Thomson

<table>
<tr><td>Course Title</td><td colspan="5">Employability Skills</td><td colspan="3">B.Tech.
Open Elective-I</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE601</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 90 Min</td><td colspan="3">External Exam Duration: 3 Hrs</td></tr>
</table>

Introduction: Employability skills play an important role in one’s career. Professional skills are a person’s skill set and ability to perform a certain type of activity or task. Employability skills are a person’s ability to interact effectively with co-workers and customers. Hard skills are mainly applicable at the work place. Employability skills are applicable both at workplace and outside the work place. Employability skills complement the hard skills which are occupational requirement of a job. It also complements many other activities even outside the work place. Presently employability skills are increasingly sought out by employers in addition to standard qualification. There are instances of professions where employability skills proved to be more important, on a long term basis than occupational skills. Employability skills refer to behavior, communication, IT Skill, work ethics etc. which makes a person suitable to effectively work in a team. Studies suggest that employability skills are equally important indication of job performance as hard skills. The competency level of the worker increases with the Employability skills and takes him to the next level.

Course Objectives: The main objective of this course is to make the the students

i. Demonstrate effective presentations

ii. Develop and practice self-management skills

iii Assess and improve personal grooming

iv. Create safety awareness including rules and procedures on the work site.

v. Survey the required skills for discussing and resolving problems in the work arena.

Course Outcomes: On success Completion This course ,the students will be able to

CO1	Demonstrate presentations
CO2	Develop and practice self-management skills
CO3	Assess and improve personal grooming
CO4	Create safety awareness including rules and procedures on the work site.
CO5	Survey the required skills for discussing and resolving problems in the work arena.

UNIT–1 Communication and Teamwork – Communicating effectively, Interpersonal and Intrapersonal skills, A good leader, Leadership behavior, Assertiveness skills.

UNIT -2 Etiquette and Manners – Social and Business. Time Management – Concept, Essentials

Tips – prioritization, Kinesics, Adaptability Skills.

UNIT –3 Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution, Conflict Management.

UNIT -4 Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress.

UNIT –5 Interview and Presentation Skills: Definition, in-depth perspectives of interviewer and interviewee, preparation – before, during, after, overcoming nervousness, tips for success, Interviewer and Interviewee – Presentation Skills: Types, Content, Audience Analysis, Essential Tips

References:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.

2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.

4. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

5. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012. 6. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

<table>
<tr><td>Course Title</td><td colspan="4">ADVANCED NUMERICAL METHODS (R20)</td><td colspan="3">OPEN ELECTIVE - I</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE602</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>--</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hours</td></tr>
</table>

Course Objectives:

1. To solve algebraic, transcendental equations and system of linear equation by various methods.
2. To interpolate and approximate equal and unequal intervals by various formulae.
3. To discuss approximation of numerical differentiation and integration.
4. To solve Ordinary Differential Equations (ODEs) in initial value problems (IVPs) by various methods.
5. To solving ODEs & partial Differential Equations (PDEs) in boundary value problems (BVPs) by various methods.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basic knowledge on solution of system of equations.
CO 2	Use interpolation and approximation to solve engineering problems.
CO 3	Estimate the numerical differentiation and integration.
CO 4	Apply initial value problems for solving first order differential equation.
CO 5	Discuss the boundary value problems in ordinary and partial differential equations.

UNIT I:

Solution of Equations: Solution of algebraic and transcendental equations- Fixed point iteration method, Horner's Method.

Solution of linear system of equations: Gauss Crout's Method, Relaxation method.

UNIT II: Interpolation and Approximation

Finite Differences-Other Difference Operators- To find one or more missing terms. Divide Difference - Newton's divided difference interpolation, Inverse interpolation formula.

UNIT III: Numerical Differentiation and Integration

Numerical differentiation: Finding first and second order derivatives using Newton's formulae. Numerical integration: Newton - Cote's quadrature formulae, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

UNIT IV:Initial Value Problems for Ordinary Differential Equations

Single Step methods: Taylor's series method, Euler's method, Fourth order Runge - Kutta method for solving first order equations.

Multi step method: Milne's predictor - corrector method.

UNIT V: Boundary Value Problems in Ordinary and Partial Differential Equations

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's equation.

Text books:

1. Grewal.B.S., and Grewal.J.S., "Numerical methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2007.
2. Kandasmay,P; Thilagavathy, K; Gunavathi, K, Numerical Methods, S.Chand And Company Ltd, 2007.
3. Applied Numerical Analysis, Pearson Publishers, 7th Edition, Curtis F. Gerald, Patrick O. Wheatley.
4. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 10th edition Reprint 2021.

Reference Books:

1. Chapra.S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Sankara Rao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi. 2007.
3. Applied Numerical Methods with MATLAB for Engineers and Scientists, Special Indian Edition, Steven C Chapra.
4. Advanced Engineering Mathematics, Neil Opeter V.

Course Title	ENGINEERING MATERIALS					OPEN ELECTIVE- 1		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE607	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**
		3	**0**	**0**	**3**	40	60	100
					End Exam Duration: 3Hrs			

COURSE OBJECTIVES:

1.This introductory course is aimed to obtain basic exposure to the concepts of crystalline solids, its imperfections and basics of various advance engineering materials finding wide spread application in several industries.
2.Describe the process that is used to produce glass-ceramics.
3.To enlighten the periodic arrangement of atoms in crystals to provide fundamentals related to structural analysis through powder diffraction method.
4.Understanding these material systems are vital for investigating the defects and their nature on these classes of materials.

Course Outcomes: Upon completion of the course, the student will be able to:	
CO1	**Classify** various crystal systems.
CO2	**Explain** the applications of magnetic materials.
CO3	**Analyze** the various metallurgical factors influencing the performance of materials for different Structural engineering applications.
CO4	**Interpret** Lorentz field and Claussius-Mosotti relation in dielectrics.
CO5	**Identify** applications of semiconductors in electronic devices .

Unit –I: Structure of Metals

Introduction-Different types of bonding in solids – Space lattice, Basis, unit cell and lattice parameters – Bravais Lattice – Crystal systems – Packing fraction – Coordination number – Packing fraction of SC, BCC .

Unit– II: Magnetic Materials

Introduction to magnetic materials - Classification of magnetic materials: Dia, Para & Ferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis loop– Soft and Hard magnetic materials.

Unit– III: Ceramics

Introduction-Types and applications of ceramics- Glasses - Glass-Ceramics - Clay Products - Refractories - Abrasives Cements - Advanced Ceramics - Materials of Importance—Piezoelectric Ceramics

Unit –IV: Dielectric Materials

Introduction to Dielectrics-Electric polarization- Dielectric polarizability, Susceptibility and Dielectric constant-Types of polarizations(Qualitative)–Frequency dependence of polarization-Lorentz(internal) field-Classius-Mosotti equation- Applications of Dielectrics

Unit –V: Electrical Properties of materials

Electrical conduction: - Ohm's Law - Electrical Conductivity- Electronic and Ionic Conduction - Energy Band Structures in Solids.

Semiconductivity:- Intrinsic Semiconductor - Extrinsic Semiconductor - The Temperature Dependence of Carrier Concentration - Hall Effect - Applications

Text Books:

1. Callister's Materials Science and Engineering: Wiley, Second Edition, (2018)
2. V. Raghavan, Materials Science and Engineering, Prentice Hall of India, 5th edition (2013).
3. G.E. Dieter, Mechanical Metallurgy, Mc-Graw Hill, 3rd edition (2013).

Reference Books:

1. L. H. Van Vlack, Elements of Materials Science and Engineering, Addison Wesley, 6th edition (1989).
2. I. J. Polmear, Light Alloys: Metallurgy of the Light Metals, Wiley, 3rd edition (1995).
3. V. Raghavan, Physical Metallurgy: Principles and Practice, PHI Learning Private Limited, 2nd edition (2006).

<table>
<tr><td>Course Title</td><td colspan="5">Basics of Nanotechnology</td><td colspan="3">B. Tech.
(Open elective-I)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE604</td><td rowspan="2">Open Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To make the students acquire an understanding the Nanoscience and Applications
- Student will be able to understand and control matter at the nanoscale leads to a revolution i technology and industry that benefits society.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Acquire knowledge about structure and properties of nano materials
CO 2	Synthesis of nanomaterials by various methods & their applications
CO 3	Identify and understand various top-down and bottom-up approaches for nanomaterial synthesis
CO 4	Correlate properties of nanostructures with their size, shape
CO 5	Appreciate enhanced sensitivity of nanomaterial-based sensors and their novel applications in industry

Unit-I: Introduction

History and Scope, Introduction to nanomaterials, Classification of nanomaterials with suitable examples, Structure of different nanomaterials- Graphenes, CNT's, Fullerene, Properties of nanomaterials-Chemical, Optical, Thermal , Electrical Mechanical.

Learning Outcomes:

At the end of the unit, The students will be able to

- Classification of nanomaterials.
- Identify different structures of nanomaterials.

Unit-2: Synthesis of Nanomaterials

Chemical precipitation and Co-precipitation, Sol-gel synthesis, Electrochemical synthesis, Photochemical synthesis, Evaporation method-Principal & its uses

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain Sol-gel method.
- Discuss electrochemical and chemical methods of synthesis.

Unit-3: Fabrication of Nanomaterials

Top-Down method (Ball milling), Bottom-up method (chemical vapour deposition method, Sol gel method), Self-assembly method, Electric arc method. Nanocomposite fabrication.

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain methods used in fabrication of different nanomaterials

Unit-4: Properties of Nanomaterials
Importance of nano particle, effect of Size on optical, electronic, photonic, mechanical, magnetic and catalytic properties.

Learning Outcomes:
At the end of the unit, The students will be able to
- Explain the importance of nano particles.
- Discuss the effect of size on different properties.

Unit-5: Applications of Nanomaterials

Applications of Nano electronics, Nanooptics, Nano scale chemical & biosensing, biological/ Biomedical applications, Photo voltaic fuel cells-Related applications

Learning Outcomes:
At the end of the unit, The students will be able to
- Know the applications of nanomaterials in different fields.

Textbooks:
1. Text Book of Engineering Chemistry, Shashi Chawla, Dhanapath Rai Publications, New Delhi, 4th Edition, 2011.
2. Textbook of Nanoscience and Nanotechnology in Engineering, Marcel Van de Voorde (Ed.), De Gruyter publications
3. Nanoparticles-Biological activities and nanotechnology, Mindy Adams, NY Research Press
4. Theory and applications of Nano particals, Andrew Green, NY Research Press

Reference Books:
1. Textbook of Nanoscience & Nanotechnology, B.S. Murthy p. Shankar Baldev, University Press-IIM
2. Nanotechnology- A future technology with Visions-BPB Publications
3. Nanotribology, edited by Stephen M. Nsu, Z. Charles Ying, Springer International Edition
4. Introduction to Nanotechnology, Charles P. Poole Jr. Frank J. Owens, Willey Students Editions.

<table>
<tr><td>Course Title</td><td colspan="5">WRITE IT RIGHT</td><td colspan="3">OPEN ELECTIVE - I</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE605</td><td rowspan="2">HUM</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>--</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hours</td></tr>
<tr><td colspan="9">Course Objectives:
1.To help students get the basics right.
2.To grasp the nature of the writing exercise one has embarked upon
3. To promote effective writing across a whole range of tasks that all of us face on a daily basis</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Utilize effective techniques for writing job applications /course application.</td></tr>
<tr><td>CO 2</td><td colspan="8">Recall the contents to make use of good paragraph writing.</td></tr>
<tr><td>CO 3</td><td colspan="8">Identifying grammatical errors and can make necessary corrections.</td></tr>
<tr><td>CO 4</td><td colspan="8">Demonstrate effective grammatical skills in English.</td></tr>
<tr><td>CO 5</td><td colspan="8">Paraphrase a piece of writing and summarize it easily.</td></tr>
</table>

Syllabus:

Unit 1.

1. The logic of Effective Writing
2. Applying for a course: Applying for a job
3. Writing Correct and Convincing sentences

Unit 2:

1. Generating Ideas through Prewriting
2. Using the Patterns of Paragraph Development:
    a. Narration
    b. Description
    c. Argument
    d. Exposition

Unit 3:

1. Punctuation – list of punctuation marks- their usage for effective written communication

2. Misplaced modifiers

3. Confused words

4. Common mistakes in English

5. The Right Use of the definite article

Unit4:

1. Report writing – types – sample reports

2. e-mail writing

3. Elements of good essay

Unit 5:

1. Precise Writing

2. Developing of an idea/ Expansion

3. Note-making

Text books:

1. Write it Right: A Handbook for Students authored by John Peck and Martin Coyle published by Palgrave Macmillan in New York and Hampshire in 2005.

2. Odyssey- A Guide to Better Writing by William. J. Deborah Lawton Published by Allyn and Bacon.

Reference books

1. Heffron, Jack (ed). The Best Writing on Writing. Story Press, Cincinnati, Ohio, 1994.

2. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.

3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.Oxford Learners Dictionary, 12 th Edition, 2011

<table>
<tr><td>Course Title</td><td colspan="5">Human Capital Management</td><td colspan="3">B.Tech. Open Elective-1</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE606</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 90 Min</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives: The objective of the course is

- TOenablethestudentstounderstandtheHRManagementandsystematvariouslevelsingeneralandincertainspecificindustriesororganizations.
- To help the students focus on and analyze the issues and strategies required to select and develop man power resources.
- To develop relevant skills necessary for application in HR related issues.
- ToEnablethestudentstointegratetheunderstandingofvariousHRconceptsalongwiththedomainconceptinordertotakecorrectbusinessdecisions.

Course Outcomes: On successful completion of this course, the students will be able to

CO1	UnderstandingofrolesandresponsibilitiesofHRdepartmentinindustries.
CO2	Have knowledge to understand job analysis and design jobs.
CO3	Understand job evaluation and estimate HR requirements.
CO4	Able to conduct recruitment & selection process.
CO5	Abletounderstandtrainingmethods.Haveclarityofemployeecompensation

Unit-I

Introduction of HRM: Nature, scope, objectives, Importance and functions, Evolution of the concept of HRM, Human resource management in India; Roles of HR manager, Practice in Industry

Unit-II

Job Analysis &Design: Job Analysis-Meaning, Uses, Process and methods of collecting data for job analysis, Job Description, Job Specifications, Factors affecting Job Design, Techniques of Job Design.

Unit-III

Job Evaluation and Human Resources Planning: Objectives of Job Evaluation; Advantages and Limitations of Job Evaluation, Human Resources Planning (HRP), Need and Benefits of HRP, Process of HRP ,Factors Affecting HRP, Responsibility for HRP.

Unit-IV

Recruitment & Selection: Factors Affecting Recruitment; Sources of Recruitment; Selection Process, Methods of selection-Interviews, Tests, Need for Training and Methods of Training.

Unit-V

Human Resource Development: Meaning, Definition of HRD, objectives, Significance, functions and HRD process.

Text Books:

1. HumanResourceandPersonnelManagement-TextandCases:K.Ashwathappa,TataMcGrawHillEducationPvt.Ltd.
2. PersonnelandHumanResourceManagement-P.SubbaRao,HimalayaPublishing.
3. Human Resource Management – John M Lvancevich (1988) Publish – Irwin Mcgraw Hill.
4. Human Resource Management – Greg L. Stweart John wiley & sons, Inc Publications.
5. Human Resource Development_ Mohammad mohsim (2010) Publisher Vdm Verldg Dr. Muller.

Reference Books:

1. Human Resource Management: P.Jyothi, Publication,OxfordUniversityPress

<table>
<tr><td>Course Title</td><td colspan="5">Web Technologies
(Professional Elective Course-I)`</td><td colspan="3">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005504</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Familiarize the tags of HTML.
- Write backend code in PHP language and Writing optimized front end code HTML and JavaScript.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Enumerate the Basic Concepts of Markup Languages.
CO 2	Develop web Applications using Scripting Languages & Frameworks.
CO 3	Make use of Express JS frameworks.
CO 4	Develop server side programs using PHP.
CO 5	Accessing database through PHP.

UNIT - I

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, HTML styles, Elements, Attributes, Heading, Layouts, HTML media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats,

UNIT - II

JavaScript: Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions,

UNIT - III

Fundamentals of Angular JS and NODE JS Angular Java Script- Introduction to Angular JS. **Expressions:** ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

UNIT - IV

PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. PHP Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, Authenticating users.

UNIT - V

Database connectivity – Basic Database Concepts, Connecting to a MYSQL database, JSP, PHP, Practice of SQL Queries. Introduction to Mongo DB and JQuery.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.
2. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
3. Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016
4. Java Script & jQuery the missing manual, 2nd Edition, David sawyer mcfarland, O'Reilly, 2011.
5. Beginning PHP and MySQL, 5th Edition, Jason Gilmore, Apress Publications (Dream tech.)

Reference Books:

1. Ruby on Rails Up and Running, Lightning fast Web development, 1st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006.
2. Programming Perl, 4th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly, 2012.
3. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.

<table>
<tr><td>Course Title</td><td colspan="4">Multimedia Systems
(Professional Elective Course-I)</td><td colspan="3">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005505</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To adapt the architecture for design of multimedia system.
- To solve issues related to multimedia file handling.
- To adopt hypermedia standards in developing multimedia applications.
- Know the basics of creating multimedia applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze and synthesis the key components of multimedia technologies including text, audio and graphics.
CO 2	Understand the key components of multimedia technologies including video, animation and compression techniques.
CO 3	Examine various process scheduling techniques.
CO 4	Recall the data storage and retrieval methods.
CO 5	Interpret reference model for multimedia synchronization and summarize applications of multimedia.

UNIT - I

Multimedia: Definition, Where to use multimedia, Medium, Main properties of multimedia system, Traditional data stream characteristics, Data stream characteristics for continuous media, Information units.

Sound/Audio: Basic sound concepts, Music, Speech**. Images/Graphics:** Basic concepts, Computer image processing.

UNIT - II

Video and Animation: Basic concepts, Television, Computer based animation**.**

Data Compression: Storage space, Coding requirements, Source, Entropy and Hybrid coding, Some basic compression techniques, JPEG, H.261,(Px64), MPEG, DVI.

UNIT - III

Computer Technology: Communication Architecture, Multimedia Workstation**.**

Multimedia Operating Systems: Introduction, Real time, Resource management, Process management.

Multimedia Communication systems: Application Subsystem, Transport subsystem.

UNIT - IV

Database Systems: Multimedia Database Management System, Characteristics of an MDBMS, Data Analysis, Data Structure, Operations on data, Integration in a Database model.

Documents, Hypertext and MHEG: Documents, Hypertext and Hypermedia, Document Architecture ODA, MHEG.

UNIT - V

Synchronization: Introduction, Notion of Synchronization, Presentation requirements, Reference model for multimedia synchronization, Synchronization specifications.

Multimedia Applications: Introduction, Media Presentation, Media Composition, Media Integration, Media Communication, Media Consumption, and Media Entertainment.

Text Books:

1. "Multimedia: Computing, Communications and Applications", Ralf Steinmetz and KlaraNahrstedt, Pearson Education.
2. "Multimedia: Making It work:, Tay Vaughan, Pearson Education.
3. " Multimedia Systems", Koegel Buford, Pearson Education
4. "Fundamentals of Multimedia , Ze-Nian Li, Mark.S.Drew, Springer.

Reference Books:

1. " Multimedia System design ", Prabhat K. Andheigh, Kiran Thakrar, THM
2. " Multimedia Communication Systems: Techniques, standards and networks, K.R.Rao, D.Milovanovic.
3. Introduction to Multimedia, Ramesh Bangia, Firewall Media.
4. Principles of Multimedia, 2nd Edition, Ranjan Parekh, MAT Lab examples.

Course Title	Distributed Systems (Professional Elective Course-I)					B.Tech V Sem (R20) CSE		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2005506	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To make the student to understand the features of distributed systems.
- Creating awareness among students on processes and synchronization among processes.
- Learn the concepts of consistency models, replication and fault tolerance in distributed systems.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Identify the core concepts of distributed systems.
CO 2	Understand the concepts of threads and communication mechanisms for processes.
CO 3	Develop the clock synchronization, mutual exclusion and election algorithms.
CO 4	Analyze the consistency and replication models.
CO 5	Understand the fault tolerance mechanisms in distributed systems.

UNIT - I

Introduction: Definition of a distributed system, Goals, Types of distributed systems.

Architectures: Architecture styles, System architectures.

UNIT - II

Processes: Threads, virtualization, clients, servers, code migration.

Communication: Fundamentals, Remote Procedure Call, Message oriented communication, Stream oriented communication, Multicast communication.

UNIT - III

Synchronization: Clock synchronization, Logical clocks, Mutual exclusion, Election Algorithms.

UNIT - IV

Consistency and Replication: Introduction, Data centric consistency models, Client centric consistency models, Replica management, Consistency protocols.

UNIT - V

Fault Tolerance: Introduction to fault tolerance, Process resilience, Reliable client server communication, Reliable group communication, Distributed commit, Recovery.

Text Books:

1. Andrew S. Tanenbaum, Marteen Van Steen, "Distributed Systems: Principles and Paradigms", 2nd Edition, PHI.
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems – Concepts and Design", Fourth Edition, Pearson Education.
3. Andrew S. Tanenbaum, "Distributed Operating System", Pearson Education.
4. Pradeep K. Sinha, "Distributed Operating Systems – Concepts and Design", PHI publications.

Reference Books:

1. Distributed Systems and Algorithm Analysis, Randy Chew, Theodove Johnson, Pearson.
2. Distributed Systems and Paradigms, Andrew. S. Tanenbaum, Maarten Van Steen, 2nd Edition, Pearson.
3. Distributed Systems: Computing over Network, Joel M. Crichlow, 2nd Edition, PHI.

<table>
<tr><td>Course Title</td><td colspan="5">Design And Analysis of Algorithms Lab</td><td colspan="3">B.Tech CSE V Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005507</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Learn how to analyze a problem and design the solution for the problem.
- Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design algorithms using appropriate design techniques (divide and conquer, greedy, dynamic programming, etc.,).
CO 2	Implement variety of algorithms such as sorting, searching, graph related, etc., ina high level language.
CO 3	Analyze and compare the performance of algorithms using language features.

<u>Experiments:</u>

1. Write a program to perform Selection sort for any given list of numbers.
2. Write a program to perform Bubble sort for any given list of numbers.
3. Write a program to perform Sequential Search for any given list of numbers.
4. Write a Program to perform Merge Sort on the given two lists of integer values
5. Write a program to perform Quick Sort for the given list of integer values.
6. Write a program to find solution for knapsack problem using greedy method.
7. Write a program to find minimum cost spanning tree using Prim’s Algorithm.
8. Write a program to find minimum cost spanning tree using Kruskal’s Algorithm.
9. Write a program to perform Dijkstra’s algorithm.
10. Write a program to implement Floyd’s algorithm.
11. Write a program to solve N-QUEENS problem.
12. Write a program to solve Sum of subsets problem for a given set of distinct numbers.

Text Books:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran,"Fundamentals of Computer Algorithms", Galgotia Publications.
2. Levitin, Anany." Introduction to the design & analysis of algorithms**"** Pearson Education, 2008.
3. Udit Agarwal," Algorithms Design and Analysis",Dhanpath Rai & Co,2017.
4. Sedgewick Robert and Kevin Wayne, "Algorithms" , Pearson Education, Forth Edition.
5. Parag H.Dave Himanshu B.Dave "Design and Analysis of Algorithms" Pearson Education 2008.

Reference Books:

1. Aho, Hopcroft, Ulman,"the Design and Analysis of Computer Algorithms" Pearson Education, 2000.
2. Steven S.Skiena," The Algorithm Design Mannual", Spingers, Third Edition.
3. R.L.Rivest and C.Stein" Introduction to Algorithms",Second Edition, Pearson Education
4. M.T.Goodrich and R.Tomassia, John Wiley and sons," Algorithm Design: Foundations, Analysis and Internet examples".
5. Sanjoy Dasgupta, Christos H Papadimitriou, Umesh Virkumar Vazirani, "Algorithms" , McGraw-Hill Higher Education,2008

Course Title	**Advanced English & Communication Lab (Soft Skill Oriented Course)**					**B.Tech CSE V Sem (R20)**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20245SC	**SC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	**0**	**4**	**2**	**40**	**60**	**100**
					End Exam Duration: 3Hrs			

Course Objectives:

- Interpret using language effectively in Group Discussions
- Develop the required skills for facing interviews and public speaking
- Analyze improving of language proficiency
- Build confidence by exposing to various situations and contexts for their successful professional career.
- Develop them industry – ready

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Interpret using language effectively in Group Discussions.
CO 2	Develop the required skills for facing interviews and public speaking.
CO 3	Analyze improving of language proficiency.
CO 4	Build confidence by exposing to various situations and contexts for their successful professional career.
CO 5	Develop them industry – ready.

1. **Syllabus:**

The following course content is prescribed for the Advanced English Communication Skills:

1.Functional English -- Starting & Responding to a Conversation-- Social Etiquette, Formal and informal Conversation -- Role play – Body language in conversation—departing phrases.

2.Technical Report Writing --- Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis, sample report.

3.Resume' Writing --- Structure, format and style, planning, defining the career, objective, projecting one's strengths and skills, creative self-marketing, cover letter.

4.Group Discussion--- Communicating views and opinions, discussing, intervening.Providing solutions on any given topic across a cross-section of individuals, (keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

5. Interview Skills --- Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing.

2. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc.

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-Van Solutions.

Text Books:

1. Technical writing and professional communication, Huckin and Olsen Tata McGraw-Hil 2009.

2. Speaking about Science, A Manual for Creating Clear Presentations by Scott Morgan and Barrett Whitener, Cambridge University press, 2006.

3. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learomg 2008.

4. Technical Communication by Meenakshi Raman &Sangeeta Sharma, Oxford University Press 2009.

5. The ACE of Soft Skills by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010.

6. Cambridge English for Job-Hunting by ColmDownes, Cambridge Unicversity Press, 2008.

7. Resume’s and Interviews by M. Ashraf Rizvi, Tata McGraw-Hill, 2008.

8. From Campus to Corporate by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010.

9. English Language Communication: A Reader cum Lab ManualDr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

<table>
<tr><td>Course Title</td><td colspan="4">Community Service Project</td><td colspan="4">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005510</td><td rowspan="2">PROJ</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>1.5</td><td>100</td><td>-</td><td>100</td></tr>
<tr><td colspan="5">Internal Evaluation</td><td colspan="4"></td></tr>
<tr><td colspan="9">Course Objectives:
The objective of the project is to enable the student to take up investigative study in rural areas/ Community in the field of Computer Science and Engineering.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand core concepts and research findings relative to human development, socialization, group dynamics and life course processes.</td></tr>
<tr><td>CO 2</td><td colspan="8">Identify and transfer existing ideas into new contexts and applications.</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply and transfer academic knowledge into the real-world.</td></tr>
<tr><td>CO 4</td><td colspan="8">Design a component or a product applying all the relevant standards and with realistic Constraints.</td></tr>
</table>

The following are the rules and regulation for **Community Service Project Projects:**

1. The student has to spend 50 to 60 Hrs in the semester on any Community Service Project and submit a report for evaluation.
2. The project is evaluated for 100 marks in the semester by a committee consisting of head of the department, project mentor and one senior faculty member of the department.
3. A student shall acquire 2 credits assigned, when he/she secures 50% or more marks from the total of 100 marks.
4. In case, if a student fails, he/she shall resubmit the report.
5. There is no external evaluation for the Community Service Project.

<table>
<tr><td>Course Title</td><td colspan="4">Constitution of India
(Mandatory Course)</td><td colspan="3">B.Tech V Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20MC509</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>0</td><td>40</td><td>--</td><td>40</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4"></td></tr>
</table>

Course Objectives:

- To realize the significance of the constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To understand the functioning of Union, State and Local Governments in the Indian federal system.
- To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the historical background of the constitution making and its importance for building a democratic India.
CO 2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO 3	Explain the value of the fundamental rights and duties for becoming good citizen of India.
CO 4	Analyze the decentralization of power between central, state and local self-government.
CO 5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

UNIT - I

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

UNIT - II

Union Government and its Administration Structure of the Indian Union: Center- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet an Central Secretariat, LokSabha, RajyaSabha, 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 – ZillaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy – (Different departments), Village level – Role of Elected and Appointed officials.

UNIT - V

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

Text Books:

1. M.V.Pylee, "Introduction to the Constitution of India",4th Edition, Vikas publication,2005.

2. Durga Das Basu(DD Basu) , "Introduction to the constitution of India",(Student Edition),19th edition,Prentice-Hall EEE, 2008.

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subhash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Seervai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government andPolitics Hans
7. J. Raj IndianGovernment and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Ci vil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

- nptel.ac.in/courses/109104074/8
- nptel.ac.in/courses/109104045/
- nptel.ac.in/courses/101104065/

B.Tech VI SEM CSE (R20)

Course Title	Internet of Things					B.Tech VI Sem (R20) CSE		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005601	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes						End Exam Duration: 3Hrs		

Course Objectives:

- Basic principles of IOT.
- Various IOT platforms and application development.
- To know about Arduino board.
- To know about Raspberry pi.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Demonstrate knowledge on Protocols, functional blocks and communication models of Internet of Things.
CO 2	Identify domain specific IoT's.
CO 3	Design appropriate solutions for IoT applications.
CO4	Working with Arduino board.
CO5	Design and develop applications using Raspberry pi device.

UNIT I

INTRODUCTION TO IoT:

Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Development Templates.

UNIT II

DOMAIN SPECIFIC IoTs

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.

UNIT III

IOT and M2M:

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT

IoT Platform Design Methodology:

Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

UNIT IV

Introduction to Arduino:

Introduction, The Arduino Way, The Arduino Platform, Getting started with Arudino, Advanced Input and Output, Sample Programs.

Sensors: Introduction to sensors, Transducer, Sensors characteristics.

UNIT V

IOT Physical Devices:

What is an IOT device, basic building blocks of an IOT device, Exemplary device: Raspberry Pi, about the board, linux on raspberry Pi, raspberry Pi interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Text Books:

1. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India.
2. Getting Started with Arduino, 3rd Edition, Massimo Banzi and Michael Shiloh
3. Getting Started with Raspberry Pie, Matt Richardson & Shawn Wallace, O'Reilly-2014.
4. Arshdeep Bahga, Vijay Madisetti " Internet of Things(A hands on approach)" 1STedition, VPI publications,2014.

Reference Books:

1. Raj Kamal, "Internet of Things", McGraw Hill, 1st Edition, 2016.
2. Internet of Things, Surya Durbha, Jyothi Joglekar, Oxford Higher Education.
3. The Internet of Things, Michael Miller, Pearson.
4. The Internet of Things, Samuel Greengard, The MIT Press Ltd.

<table>
<tr><td>Course Title</td><td colspan="5">Data Mining</td><td colspan="3">B.Tech VI Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005602</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To learn the concepts of database technology evolutionary path which has led tothe need for data mining and its applications
● To develop skills of using data mining techniques for solving practical problems.
● To learn Data mining algorithms to build analytical applications.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the fundamentals of Data Mining and its Principles.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand different steps followed in Data mining and pre-processing for Datamining.</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply appropriate data mining algorithms to find Frequent patterns , Associations, and Correlations.</td></tr>
<tr><td>CO4</td><td colspan="8">Compare and evaluate data mining techniques classification, prediction.</td></tr>
<tr><td>CO5</td><td colspan="8">Cluster the high dimensional data for better organization of the data and to detectthe Outliers in the high dimensional data.</td></tr>
</table>

UNIT - I

Introduction: Why Data Mining? What Is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Major issues in Data Mining.

UNIT - II

Data Preprocessing:

Why Pre-process the Data? Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

UNIT - III

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods: Basic Concepts, Frequent Itemset Mining Methods, From Association Analysis to Correlation Analysis, Pattern Mining in Multilevel, Multidimensional Space, Constraint- Based Frequent Pattern Mining.

UNIT - IV

Classification:

Basic Concepts, Decision Tree Induction, Baye’s Classification Method, Rule-Based Classification.

Prediction: Basic concepts, Accuracy and Error measures, Evaluating the accuracy of a classifier or apredictor.

UNIT - V

Cluster Analysis: Cluster Analysis basic concepts, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods.

Outlier Detection - Outliers and Outlier Analysis, Outlier Detection Methods

Text Books:

1. Data Mining: Concepts and Techniques, Jiawei Han , MichelineKamber and Jian Pei, Morgan Kaufmann Publishers, Elsevier, Third Edition,2012.
2. Data Warehousing in the Real world, Sam Aanhory& Dennis Murray , Pearson Education, Asia.
3. Intelligent Data Mining, Da Raun.Guoquing Chen, Etienne E. Kerre. Geert Wets, Springer.
4. Data Mining & Data Warehousing: Principles and Practical Techniques, Parteek Bhatia, Cambridge.

Reference Books:

1.Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.

2.Insight into Data Mining, K.P.Soman, S.Diwakar , V.Ajay, PHI2008.

3.Data Mining: Introductory and Advanced Topics, Margaret H. Dunhan, Pearson.

4.Data Mining, Vikram Pudi, P. Radha Krishna, Oxford Higher Eduction.

<table>
<tr><td>Course Title</td><td colspan="5">Cryptography & Network Security</td><td colspan="3">B. Tech. VI Sem CSE (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005603</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Extensive, thorough and significant understanding of the concepts, issues, principles and theories of computer network security
- Identifying the suitable points for applying security features for network traffic
- Understanding the various cryptographic algorithms and implementation of the same.
- Understanding the various attacks, security mechanisms and services.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
CO 2	Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.
CO 3	Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
CO 4	Apply different digital signature algorithms to achieve authentication and create secure applications.
CO 5	Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP.
CO 6	Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security, Classical encryption techniques-symmetric cipher model, substitution ciphers, transposition ciphers, Steganography, Modern Stream ciphers.

UNIT II

Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, Block cipher modes of operations, AES, RC4.

Introduction to Number theory : Integer Arithmetic, Modular Arithmetic,Linear Congruence, Algebraic Structures, GF(2n) Fields, Primes, Factorization, Chinese remainder Theorem, Quadratic Congruence.

UNIT III

Public-key cryptography : Principles of public-key cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, ELGamal cryptographic system.

Cryptographic Hash functions: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA).

UNIT IV

Message Authentication Codes: Message authentication Requirements, Message authentication functions, Message authentication codes, security of MACs, HMAC.

Digital Signatures: Digital Signatures, Schnorr Digital Signature Scheme, Digital Signature Standard.

UNIT V

User Authentication: Remote user Authentication Principles, Kerberos

Electronic mail security: Pretty Good Privacy (PGP), S/MIME Worms, Viruses, Firewalls.

Text Books:

1. Cryptography and network Security by Fourth edition, Stallings, PHI/Pearson
2. Cryptography & Network Security by Behrouz A. Forouzan, TMH.
3. Network Security: The complete reference by Robert Bragg, Mark Rhodes, TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G.T.Gangemi Sr., SPD O'REILLY.

Reference Books:

1. Cryptography and network Security by Atul Kahate, 4th Edition, Tata McGraw Hill.
2. Understanding Cryptography, Christof Paar. Jan Pelzl, Springer.
3. Introduction to Modern Cryptography, Jonathan Katz, Yehuda Lindell, 2nd Edition, CRC.

Course Title	Solid Waste Management					B.Tech CE VI Sem (R20)		
CourseCode	Category	Hours/Week			Credits	Maximum Marks		
20OE104	Open Elective (OEC II)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 1.5 Hrs						End Exam Duration: 3 Hrs		

Course Objectives:

To know the necessity of solid waste management
To study various strategies for the collection of solid waste
To understand various solid waste disposal methods
To understand how to categorize the Hazardous Wastes

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand and identify the physical and chemical composition of solid waste.
CO 2	Understand the optimum route planning for transport of solid waste.
CO 3	Understand the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
CO 4	Understand the design of waste disposal systems.
CO 5	Understand the sources and how to manage the different categories of Hazardous Wastes.

UNIT - I

Introduction to Solid Waste

Definition - Types of solid waste - sources of solid waste - Characteristics - properties of solid wastes - Sampling of Solid wastes - Elements of solid waste management

UNIT - II

Solid Waste Management

Solid waste generation - onsite handling - storage and processing - collection of solid wastes - Stationary container system and Hauled container systems - Route planning - transfer and transport.

UNIT - III

Resource and Energy Recovery

Processing techniques - materials recovery systems - Composting - types of composting - Problems with composing – Pyrolisis – Gasification - RDF - recovery of energy from conversion products - materials and energy recovery systems.

UNIT - IV

Landfills

Types and Construction of landfills - Design considerations - Life of landfills - Landfill Problems - Lining of landfills - Leachate pollution and control - Landfills reclamation.

UNIT - V

Hazardous Waste Management

Sources and characteristics - Effects on environment - Risk assessment - Disposal of hazardous wastes - Secured landfills, incineration - Biomedical waste disposal - E-waste management

Text Books:

1. Tchobanoglous G, Theisen H and Vigil SA ‘Integrated Solid Waste Management, Engineering Principles and Management Issues’ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/Cole Thomson Learning Inc., 2002.

Reference Books:

1. CPHEEO Manual on Municipal Solid Waste Management - 2000
2. Qian X, Koerner RM and Gray DH, ‘Geotechnical Aspects of Landfill Design and Construction’ Prentice Hall, 2002.
3. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’, McGraw Hill Inc., New York, 1985.

<table>
<tr><td>Course Title</td><td colspan="5">Estimation and Costing</td><td colspan="3">B.Tech CE VI Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE105</td><td rowspan="2">Open Elective (OEC II)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To attain basic knowledge on types of quantity estimation of structures different types of structures and estimate quantities of load bearing wall structures
To interpret the rates of different items of works involved in a construction activity.
To understand various types & conditions of contracts and related documentation
To know about various techniques of valuation of land and building properties
To get basic knowledge on various types of costing along with cost control and reduction techniques.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Estimate quantities of various types of load bearing wall structures.</td></tr>
<tr><td>CO 2</td><td colspan="8">Calculate the rates of different items of works involved in a construction activity.</td></tr>
<tr><td>CO 3</td><td colspan="8">Know different types of contract documents as per requirements of a project.</td></tr>
<tr><td>CO 4</td><td colspan="8">Do valuation of land and building properties.</td></tr>
<tr><td>CO 5</td><td colspan="8">Do costing of a product using various techniques.</td></tr>
</table>

UNIT-I

Introduction to the Estimation of Structures

Introduction, Different Item of Works – Units of Item of works– Types of Estimates – Methods of Estimates.

Quantity Estimation of Buildings

Estimation of Quantities in Buildings: Load Bearing Wall Structure of Single Room and Multi Room

UNIT – II

Rate Analysis

Rate Analysis of Different Item of Works: Earthwork Excavation – Mortars of Various Proportions(Cement and Lime)–Concrete with Various Proportions (Lime and Cement) – Brick Masonry – Stone Masonry – Pointing – Painting – Plastering.

UNIT – III

Contracts

Types of Contracts, Contract Document, Conditions of Contracts, Contract Procedure, Termination of Contracts, Specifications, Important Conditions of Contract, Arbitration and Tenders.

UNIT – IV

Valuation

Introduction, Technique of Valuation, Elements of Valuation and Factors Affecting Valuation, Methods of Valuation to the Land Property and Building Property, Mortgage.

UNIT – V

Costing

Fixed and variable cost, Product and Process Costing, Standard Costing, Cost estimation, Relevant Cost for decision making, Cost estimation, Cost control and Cost reduction techniques.

Text Books:

1. B N Dutta "Estimating and Costing in Civil Engineering", U B S Publishers Distributers Pvt. Limited, Noida.
2. "Standard Data Book – Vol.2", Andhra Pradesh Department of Standard Specifications,Amaravati.
3. Contracts and estimations by B.S.Patil, Universities.Press, Hyderabad
4. G.S. Birdie, Estimating and Costing, Danpatrai Publications, New Delhi, 2009
5. Riggs, J.L., Dedworth, Bedworth, D.B, Randhawa, S.U. Engineering Economics, McGraw Hill International Edition, 1996

Reference Books:

1. Dr. Roshan H Namavati "Professional Practice", The Lakhani Book Depot, Mumbai.
2. S C Rangwala "Estimating Costing and Valuation", Charotar Publishing House Pvt.Limited, Anand.
3. IS 1200 (Parts I to XXV–1974/ Method of Measurement of Building and Civil EngineeringWorks – B.I.S.)
4. M. Chakraborthi, Estimating Costing Specification and Valuation in Civil Engineering,23rd Edition, Laxmi Publications, New Delhi, 2010.

<table>
<tr><td>Course Title</td><td colspan="6">Water Management</td><td colspan="3">B.Tech CE VI Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="4">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE106</td><td rowspan="2">Open Elective (OEC II)</td><td>L</td><td>T</td><td>P</td><td>C</td><td colspan="2">Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td colspan="2">40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="10">Course Objectives:
To understand different watershed behavior
To be able to interpret runoff data and quantify erosion by using various modelling methods.
To understand land use classification and impact of land use changes on hydrological cycle parameters.</td></tr>
<tr><td colspan="10">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
</table>

CO 1	Know concept and need for watershed management.
CO 2	Aware on various causes of soil erosion and mitigation methods.
CO 3	Implement basic rain water harvesting methods.
CO 4	Understand artificial groundwater recharge methods.
CO 5	Understand the soil reclamation methods.

UNIT – I

Introduction

Concept of watershed, need for watershed management, concept of sustainable development, hydrology of small watersheds.

UNIT – II

Soil Erosion

Principles of soil erosion- causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds, Control of soil erosion, methods of soil conservation – structural and non-structural measures.

UNIT – III

Water Harvesting

Principles of water harvesting, methods of rainwater harvesting, design of rainwater harvesting structures.

UNIT – IV

Ground Water Recharge

Artificial recharge of groundwater in small watersheds-, methods of artificial recharge.

UNIT – V

Reclamation of saline soils

Micro farming - biomass management on the farm.

Text Books:

1. Murthy, V.V.N. and M.K. Jha Land and Water Management, Kalyani Publishers, 2015
2. Watershed Management by Madan Mohan Das and M.D. Saikia, Prentice Hall of India, 2013.

3. Watershed Management Muthy, J. V. S., New Age International Publishers, 1998.

Reference Books:

1. Watershed Hydrology by P E Black, Prentice Hall Englewood Cliffs, 1991.
2. Watershed Hydrology by R Suresh, Standard Publishers and Distributors, Delhi, 2020

<table>
<tr><td>Course Title</td><td colspan="5">Energy Conversion Systems</td><td colspan="3">B. Tech. EEE
Open Elective - II</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE203</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn about energy conversion techniques, sources of electrical energy production and impact of energy conversion systems on environment.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand various energy conversion systems, fuel cells & batteries</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze solar and wind energy conversion process</td></tr>
<tr><td>CO 3</td><td colspan="8">Illustrate Ocean Energy Conversion systems</td></tr>
<tr><td>CO 4</td><td colspan="8">Explain the environmental effects of Energy Conversion Systems.</td></tr>
</table>

UNIT I

Photo Voltaic Power Generation: Spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, test specifications for PV systems.

UNIT II

Wind Energy Conversion: Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

UNIT III

Tidal Power Station: Tides and Tidal power stations - modes of operation of Tidal project - Turbines and Generators for Tidal Power generation.

Ocean Thermal Energy Conversion: Types of ocean thermal energy conversion systems, Application of OTEC systems examples.

UNIT IV

Miscellaneous Energy Conversion Systems: Biomass conversion, Geothermal energy, Thermo electric energy conversion: Seebeck effect, Peltier and Thomson effects and their coefficients – Thermo-Electric Generator – Peltier Cooling

UNIT V

Fuel Cells & Batteries: Introduction - principles of EMF generation - description of fuel cells **-** Batteries, Description of batteries, Battery applications for large power.

Environmental Effects: Environmental Effects of Energy Conversion Systems, Pollution from coal and preventive measures - steam stations and pollution - pollution free energy systems.

Text Books

1. “Energy conversion systems” by Rakosh das Begamudre, New age international Private Ltd., publishers, 1st Edition, 2000.
2. “Renewable Energy Resources” by John Twidell and Tony Weir, CRC Press (Taylor & Francis).

<table>
<tr><td>Course Title</td><td colspan="5">Smart Grid</td><td colspan="3">B. Tech. EEE
Open Elective - II</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE204</td><td rowspan="2">Open Elective Course (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The student is able to learn fundamentals, Architecture and analysis of smart grid with communication, networking and measuring technologies involved in it.</td></tr>
<tr><td colspan="9">On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the features, fundamental components and architecture of smart grid</td></tr>
<tr><td>CO 2</td><td colspan="8">Explain information, communication and networking technologies involved with the smart grid</td></tr>
<tr><td>CO 3</td><td colspan="8">Explain operation and importance of PMU, WAMPS and smart storage systems in smart grid</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze Microgrid with various concepts and challenges in future</td></tr>
</table>

UNIT-1

Introduction to Smart Grid: Working definitions of Smart Grid and Associated Concepts – Need of Smart Grid – Smart Grid Functions – Opportunities & Barriers of Smart Grid - Conventional Power Grid and Smart Grid -Concept of Resilient & Self-Healing Grid.

UNIT-II

Smart Grid Architecture: Components and Architecture of Smart Grid – Review of Proposed Architectures for Smart Grid – The Fundamental Component of Smart Grid Designs – Transmission Automation – Distribution Automation –Renewable Integration.

UNIT-III

Information and Communication Technology: Smart sensors, Wired and wireless communication Technology, Network Structures (**HAN, LAN, NAN, WAN**), Introduction to Smart Meters – Advanced Metering Infrastructure (AMI).

UNIT-IV

Smart Grid Technologies: Geographic Information System (GIS) - Intelligent Electronic Devices (IED) - Smart storage like Battery- SMES - Pumped Hydro - Compressed Air Energy Storage - Wide Area Measurement System (WAMS) – SCADA - Phase Measurement Unit (PMU).

UNIT – V

Micro grids and Distributed Energy Resources: Concept of micro grid, need & application of micro grid, formation of micro grid, Issues of interconnection, protection & control of micro grid, Plastic & Organic solar cells, thin film solar cells, Variable speed wind generators, and fuel cells.

Text Books

1. Janaka Ekanayake, Kithsir iLiyanage, Jian zhong. Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.
2. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 1e,2013.
3. James Momoh, "Smart Grid: Fundamentals of Design and Analysis"- Wiley, IEEE Press, 2012.

Reference Books

1. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2e, 2017.
2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press.
3. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability", Artech House Publishers July 2011.
4. 4. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.

<table>
<tr><th>Course Title</th><th colspan="4">Automotive Electronics, Sensors & Drives</th><th colspan="3">B.Tech ME VI Sem</th></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">20OE306</td><td rowspan="2">OEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Explain the use of electronics in the automobile.
- Explain the importance of various types of sensors and actuators in automotive electroni
- Demonstrate the various control elements in Engine Management system.
- Familiarize with Vehicle management systems
- Identify various electronic and the instrumentation systems used in automobile

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Obtain an overview of automotive components, like sensors, actuators, communication protocols and safety systems employed in today's automotive industry.
CO 2	Interface automotive sensors and actuators with microcontrollers.
CO 3	Know, the various display devices that are used in automobiles
CO 4	Identify the elements in the engine management and vehicle management system.
CO 5	Summarize an overview of automotive components, like sensors, actuators, communication protocols and safety systems employed in today's automotive industry.

UNIT - I

Introduction to microcomputer

Introduction to microcomputer: Microcomputer: Buses, memory, timing, CPU registers; Microprocessor architecture: Initialization, operation codes, program counter, branch and jump instructions, subroutine. Analog to digital converters and Digital to analog converters, sampling, polling and interrupts, digital filters, lookup table.

UNIT - II

Sensors and actuators

Sensors and actuators: Speed sensors, Pressure sensors: Manifold Absolute Pressure sensor, knock sensor, Temperature sensors: Coolant and Exhaust gas temperature, Exhaust Oxygen level sensor, Position sensors: Throttle position sensor, accelerator pedal position sensor and crankshaft position sensor, Air mass flow sensor. Solenoids, stepper motors and relays.

UNIT - III

Electronic engine management system

Electronic engine management system: Electronic engine control: Input, output and control strategies, electronic fuel control system, fuel control modes: open loop and closed loop control at various modes, EGR control, Electronic ignition systems – Spark advance correction schemes, fuel injection timing control.

UNIT - IV

Electronic vehicle management system

Electronic vehicle management system: Cruise control system, Antilock braking system, electronic suspension system, electronic steering control, traction control system, Transmission control, Safety: Airbags, collision avoiding system, low tire pressure warning system.

UNIT - V

Automotive instrumentation system

Automotive instrumentation system: Input and output signal conversion, multiplexing, fuel quantity measurement, coolant temperature and oil pressure measurement, display devices- LED, LCD, VFD and CRT, Onboard diagnostics(OBD), OBD-II, off board diagnostics.

Text Books:

1. Understanding Automotive Electronics, William B Ribbens, Newne Butterworth-Heinermann, 6th edition 2003.

2. Crouse W H, Automobile Elctrical Equipment, McGraw Hill Book Co.Inc, Newyork 2005.

Reference Books:

1. Bechhold “Understanding Automotive Electronics”, SAE, 1998.

2. Robert Bosch “Automotive Hand Book”, SAE (5th Edition), 2000.

3. Tom Denton,”Automobile Electrical and Electronic Systems” 3rd edition- Edward Arnold, London - 2004.

4. Eric Chowanietz - ‘Automotive Electronics’ - SAE International USA – 1995.

<table>
<tr><td>Course Title</td><td colspan="5">Robotics and Applications in Manufacturing</td><td colspan="3">B.Tech ME VI Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE307</td><td rowspan="2">OEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Learn the fundamental concepts of industrial robotic technology.
- Apply the basic mathematics to calculate kinematic and dynamic forces in robot manipulator.
- Understand the robot controlling and programming methods.
- Describe concept of robot vision system.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Illustrate the industrial applications of robot vision system.
CO 2	Use concepts of robot controlling systems.
CO 3	Evaluate D-H notations for simple robot manipulator.
CO 4	Define a robot and homogeneous transformations.
CO 5	Apply the concepts of robot.

UNIT - I

Fundamentals of Robots

Fundamentals of Robots: Introduction, definition, classification and history of robotics, robot characteristics and precision of motion, advantages, disadvantages and applications of robots. Introduction to matrix representation of a point in a space a vector in space, a frame in space, Homogeneous transformation matrices, representation of a pure translation, pure rotation about an axis.

UNIT - II

Kinematics of robot, Differential motions and Velocities

Kinematics of robot: Forward and inverse kinematics of robots- forward and inverse kinematic equations for position and orientation, Denavit-Hartenberg(D-H) representation of forward kinematic equations of robots, The inverse kinematic of robots, Degeneracy and Dexterity, simple problems with D-H representation.

Differential motions and Velocities: Introduction, differential relationship, Jacobian, differential motions of a frame-translations, rotation, rotating about a general axis, differential transformations of a frame. Differential changes between frames, differential motions of a robot and its hand frame, calculation of Jacobian, relation between Jacobian and the differential operator, Inverse Jacobian.

UNIT - III

Control of Manipulators

Control of Manipulators: Open- and Close-Loop Control, the manipulator control problem, linear control schemes, characteristics of second-order linear systems, linear second-order SISO model of a manipulator joint, joint actuators, partitioned PD control scheme, PID Control Scheme, computer Torque control, force control of robotic manipulators, description of force-control tasks, force control strategies, hybrid position/force control, impedance force/torque control.

UNIT - IV

Robot Vision

Robot Vision: Introduction, architecture of robotic vision system, image processing, image acquisition camera, image enhancement, image segmentation, imaging transformation, Camera transformation and calibrations, industrial applications of robot vision.

UNIT - V

Robot Application in Manufacturing

Robot Application In Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text books:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,NicholasG.Odrey , Industrial Robotics — McGraw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.
3. John.J. Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley, 1

Reference Books:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley-Interscience, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.
4. Mohsen shahinpoor, A robot Engineering text book, Harper & Row Publishers,1987.

<table>
<tr><td>Course Title</td><td colspan="4">Sensors in Intelligent Manufacturing</td><td colspan="3">B.Tech ME VI Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE308</td><td rowspan="2">OEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Familiarize the sensors used in intelligent manufacturing.
- Illustrate sensors used in precision manufacturing and CNC machine tools.
- Explain sensors for monitoring of manufacturing systems.
- Outline advanced sensors used in intelligent manufacturing.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Classify various sensors used in intelligent manufacturing.
CO 2	Summarize sensors used in computer integrated manufacturing and machine sensors.
CO 3	Apply sensors used in precision manufacturing.
CO 4	Identify reasons behind machinery faults.
CO 5	Develop the Important role in making the products intelligent and highly automatic.

UNIT - I

Introduction

Introduction –Principles, classifications and characteristics of sensors – Electrical, magnetic, optical, acoustic, pneumatic, magnetic, electro-optical and vision sensors, role of sensors in intelligent manufacturing.

UNIT - II

Sensors and control in CIM and FMS:

Sensors and control in CIM and FMS: Design of CIM, decision support system for CIM, analysis of CIM, development of CIM strategy with sensors and control. FMS-Robot control with machine vision sensors-Architecture of robotic vision system, image processing, image acquisition, enhancement, segmentation, transformation, industrial application of robot vision, multi Sensor controlled robots, measurement of robot density, robot programming.

UNIT - III

Sensors in Precision Manufacturing:

Sensors in Precision Manufacturing: Testing of manufacturing components, principles and applications of digital Encoders, opto-electronic colour sensors, control applications in robotics. Sensors for CNC machine tools– linear, position and velocity sensors. Automatic identification techniques for shop floor control.

UNIT - IV

Sensors for Monitoring of Manufacturing Systems

Sensors for Monitoring of Manufacturing Systems: Principles – sensors for monitoring temperature, force, vibration and noise. Sensors to detect machinery faults.Selection of sensors and monitoring techniques.

UNIT - V

Smart / Intelligent sensors

Smart / Intelligent sensors: Integrated sensors, micro sensors, nano sensors. Manufacturing of semi conductor sensors.Fibre optic sensors – Fibre optic parameters, configurations, photoelectric sensor for long distance, sensor alignment techniques.

Text Books:

1. SabrieSoloman, Sensors and Control systems in Manufacturing, McGraw-Hill, 2/e, 2010.

2. H.K Tonshoff and I.Inasaki, Sensor Applications Vol 1: Sensors in Manufacturing, Wiley-VCH Publications, 2001.

Reference Books:

1. SabrieSoloman, Sensors Handbook, McGraw-Hill, 2/e, 2010.

2. MikellP.Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G.Odrey, Industrial Robotics, Tata McGraw-Hill, 2008.

<table>
<tr><th>Course Title</th><th colspan="5">Non-Conventional Energy Sources</th><th colspan="3">B.Tech ME VI Sem</th></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">20OE309</td><td rowspan="2">OEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- To get exposure on solar radiation and its environmental impact to power production
- To know about the various collectors used for storing solar energy and their applications
- To learn about the wind energy and biomass and its economic aspects
- To know about geothermal, Ocean and Wave energy sources
- To know about direct energy conversion systems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Determine the physics of solar radiation and its measurement techniques.
CO 2	Classify the solar energy collectors, methodologies of storing solar energy and
CO 3	Apply knowledge to develop Wind and Bio-energy systems.
CO 4	Categorize the Geothermal, Tidal, OTEC and hydelenergy, its mechanism of production and its applications.
CO 5	Illustrate the concepts of Direct Energy Conversion systems and their applications.

UNIT - I

Principles of Solar Radiation

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surfaces, instruments for measuring solar radiation and Sunshine Recorder, solar radiation data.

UNIT - II

Solar Energy Collection, Storage& Applications

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, Advantages and disadvantages of concentrating collectors over Flat plate collectors

Solar Energy Storage: Different methods of solar Thermal Energy Storage Sensible, latent heat and stratified storage, solar ponds.

Applications of Solar Energy: solar water heating, solar distillation and drying, photovoltaic energy conversion.

UNIT – III

Wind Energy & Bio-Mass Energy

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engineoperation and economic aspects.

UNIT – IV

Geothermal Energy &Energy from Oceans

Geothermal sources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Basic Principles utilization, setting of OTEC plants, thermodynamic cycles.

Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants

UNIT – V

Direct Energy Conversion Systems:

Need for DEC, principles of DEC, Thermo-electricpower generation – Basic Principle, materials, applications, MHD Power Generation-Principle, MHD systems, Fuel cells- principle and operation, types of fuel cells and their applications

Textbooks:

1. Mehmet Kanoglu, YunusA. Cengel, John M. Cimbala, Fundamental and Applications of Renewable Energy, First Edition, McGraw Hill, 2020
2. John Twidell and Tony Weir, Renewable Energy Resources, Third Edition, Routledge, 2015
3. G.D. Rai, Non-Conventional Energy Sources, Sixth Edition, Khanna Publications, 2017

Reference Books:

1. Wendell H. Wiser, Energy Resources: Occurrence,
2. Sukhatme S.P. Nayak.J. P, ‘Solar Energy – Principle of Thermal Storage and Collection”, Tata McGraw Hill, 2008.
3. Wei Tong, Wind Power Generation and Wind Turbine Design, WIT Press,2010.

<table>
<tr><td>Course Title</td><td colspan="4">Supply Chain Management</td><td colspan="3">B.Tech ME VI Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE310</td><td rowspan="2">OEC-II</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

. The objectives of this course are to

- Explain the basics of supply chain management.
- Familiarize inventory management techniques and models to ensure EOQ batch size under risk management.
- Demonstrate various distribution strategies for shipment of products.
- Focus on evaluating of strategic alliance partners and understanding of RDBMS.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the concepts of supply chain management for demand forecasting.
CO 2	Use of SCM and inventory management for procurement.
CO 3	Analyze the shipment activities and related issues.
CO 4	Build third party alliances.
CO 5	Adapt the RDBMS data for communications and analyzing future challenges and understand e-commerce strategies

UNIT - I

Understanding the supply chain

Understanding the supply chain: What is SCM? Why SCM? The Complexity, Key issues in SCM Logistics network - Introduction, Data Collection, Transportation, Ware house Management, Demand forecasting, Role of aggregate planning, MRP, ERP.

UNIT - II

Inventory management

Inventory management: Concepts of Materials Management, Economic lot size model, Effect of Demand uncertainly, Fixed order costs, Variable lead frames, Inventory under certainly & uncertainty.

UNIT - III

Distribution strategies

Distribution strategies: Introduction, Centralized vs Decentralized control, Direct shipment, Cross Docking, Push based vs Pull based supply chain.

UNIT - IV

Strategic alliances

Strategic alliances: Third party Logistics (3PL), Retailer – supplier relationship issues, requirements, success & failures, Distributor integration Types & issues.

UNIT - V

MIS & SCM

MIS & SCM: Relational Data Base Management (RDBMS), System Architecture, Communications, and Implementation of ERP, Decision support systems for SCM: e-Commerce strategies and world class supply chain management.

Text Books:

1. Sunil Chopra, Peter Meindl, Supply Chain Management: Strategy, Planning, and Operation, 4/e, Pearson, 2010.
2. David N. Burt, Donald W. Dobler , World Class Supply Management: The Key to Supply Chain Management, 2/e, McGraw-Hill/Irwin, 2003.
3. Nabil Abu el Ata, Rudolf Schmandt , Essentials of Supply chain management; Westland Publications. (2016),

Reference Books:

1. John Joseph Coyle, Edward J. Bardi, C. John Langley, The Management of Business Logistics: A Supply Chain Perspective, South-Western/Thomson Learning, 2003.
2. UpendraKachru ,Logistics and Supply Chain Management, Excel Books, 2009.
3. D. K .Agarwal, Supply Chain Management with efficient Logistics , MACMILAN 2019.

<table>
<tr><td>Course Title</td><td colspan="4">Introduction to VLSI</td><td colspan="3">Open Electives</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE403</td><td rowspan="2">OE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• To introduce the concepts of IC fabrication technologies.
• To understand scaling techniques of CMOS devices and their effects.
• To study the methods to design the basic Gate level designs and draws their corresponding Layouts.
• To provide basic idea of Subsystem design, PLDs and CMOS testing.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the operation of a MOS transistor down to the physical level.</td></tr>
<tr><td>CO 2</td><td colspan="8">Implement various logic gates and circuits using MOS transistors.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze PLD and FPGA families for logic design.</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze various CMOS testing schemes.</td></tr>
</table>

Unit-I

Introduction to VLSI: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & Bi CMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation.

Unit-II

Basic Electrical Properties: Basic Electrical Properties of MOS Circuits: Ids Vs Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit, Pass transistor, NMOS Inverter, CMOS Inverter analysis and Bi-CMOS Inverters.

Unit-III

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μ CMOS Design rules for wires, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

Unit-IV

Subsystem Design: Basic circuit concepts: Sheet resistance, area capacitance and delay calculation, Subsystem Design, Shifters, Adders, ALUs, Multipliers, High Density Memory Elements.

Unit-V

Semiconductor IC Design and CMOS testing: PLAs, FPGAs, CPLDs, Standard Cells, ach. CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Layout Design for improved Testability.

Text Books:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 Edition.

2. Weste and Eshraghian, Principles of CMOS VLSI Design, Pearson Education, 1999.

Reference Books:

1. John .P. Uyemura, Introduction to VLSI Circuits and Systems, JohnWiley, 2003.
2. Wayne Wolf, Pearson Education, Modern VLSI Design, 3rd Edition, 1997.
3. S.M. SZE, VLSI Technology, 2nd Edition, TMH, 2003.

<table>
<tr><td>Course Title</td><td colspan="4">Principles of communication systems</td><td colspan="3">Open Electives</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE404</td><td rowspan="2">OE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To understand the Basics of Telecommunication Engineering.
- To introduce the Elements of Telecommunication systems.
- To provide Knowledge about various communication systems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fundamental concepts of Telecommunication Engineering.
CO 2	Understand use of different modulation techniques used in Analog and Digital Communication.
CO 3	Understand different Telecommunication systems like Satellite communication, Optical Fiber communication, Wireless communication, Mobile communication etc. and its applications.
CO 4	Compare and contrast advantages and limitations of various Telecommunication systems.

Unit I

Basics of Telecommunication Engineering: Definition of Telecommunication, Examples of telecommunications and evolution, various types of telecommunication systems such as telephone network, Radio broadcasting system, Computer networks, Internet.

Unit II

Basic Elements of Telecommunication systems General Block schematic of communication system, Communication channels, Analog versus digital communication systems, Need of modulation, Types of analog modulation such as AM and FM, Types of digital modulation such as Pulse code modulation, delta modulation, Continuous wave modulation such as ASK, FSK, PSK.

Unit III

Introduction to Optical Fiber Communication: Use of optical fiber in communication, Principle and working of OFC system, Block diagram, Types of optical fibers, various elements required in designing OFC system, Applications such as long distance transmission links, Computer communication networks.

Unit IV

Introduction to Satellite Communication: Use of satellite in telecommunications, Launching of Satellite from earth station, Types of satellite orbits, Classification of satellite according to applications, Satellite communication link block diagram.

Unit V

Some concepts in Wireless communications: Wireless Standards: Overview of 2G and 3G, 4G cellular standards, Multiple access schemes-FDMA, TDMA, CDMA and OFDM, Modulation schemes- BPSK, QPSK. GSM, Wi-Fi & Wi-Max, Bluetooth, Recent Trends/Developments.

Text Books:

1) Simon Haykin," Communication Systems", 4th Edition, John Wiley Publication.

2) George Kenndey, " Electronics Communication systems", 4th Edition

3) John G. Proakis," Digital Communication", Tata McGraw Hill

4) T . Prat, C.W. Bostian," Satellite Communication", Wielly Publication

Reference Books:

1. S. Rappaport," Wireless communication – Principles and Practice", Pearson Education.
2. John M. Senior,"Optical Fiber Communication Principles and Practice",, Pearson Education.

<table>
<tr><td>Course Title</td><td colspan="4">OPERATING SYSTEMS
(Open Elective Course – II)</td><td colspan="4">B.Tech. VI Sem (R20UG) AI&ML</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE3903</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• Have an overview of functions of operating systems.
• Have a thorough knowledge of process management and memory management.
• To have a thorough knowledge of how handle to deadlocks.
• Learn the concepts of files, protection and security</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO1</td><td colspan="8">Understand the basic concepts related to the operating systems</td></tr>
<tr><td>CO2</td><td colspan="8">Analyze the various process scheduling algorithms and process synchronization mechanisms.</td></tr>
<tr><td>CO3</td><td colspan="8">Analyze the various memory management schemes.</td></tr>
<tr><td>CO4</td><td colspan="8">Understand the ways to deal the deadlocks and the basic concepts related to files in the system.</td></tr>
<tr><td>CO5</td><td colspan="8">Analyze the protection and security mechanism.</td></tr>
</table>

UNIT – I

Operating Systems Basics: Operating systems functions, Overview of computer operating systems, distributed systems, operating system services and systems calls, system programs, operating system structure.

UNIT – II

Process Management: Process concepts, scheduling-criteria, CPU scheduling algorithms, Evaluation of Scheduling Algorithms.

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, semaphores, Classic problems of Synchronization, monitors.

UNIT – III

Memory Management: Introduction**,** Swapping, contiguous memory allocation, paging,structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, Allocation of frames.

UNIT – IV

Deadlocks: system model, deadlock characterization, deadlock prevention,detection and avoidance, recovery form deadlock.

Files: The concept of a file, Access Methods, File Allocation Methods.

UNIT – V

Protection: Protection, Goals of Protection, Principles of Protection, Domain of protection Access Matrix, Implementation of Access Matrix.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Operating SystemConcepts", Eighth edition, John Wiley.

2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, PearsonEducation.

3. William Stallings, "Operating Systems: Internals and Design Principles", SixthEdition2009, Pearson Education.

4. D.M. Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition,TMH.

Reference Books:

1. A.S. Godbole, "Operating Systems", Second Edition, TMH.

2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition.

3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson.

4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers.

<table>
<tr><td>Course Title</td><td colspan="4">DATABASE MANAGEMENT SYSTEMS (Open Elective Course – II)</td><td colspan="4">B.Tech. VI Sem (R20UG) AI&ML</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE3904</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>ContinuousInternal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To study the physical and logical database designs, database modeling, relational hierarchical, and network models.
- To understand and use data manipulation language to query, update, andmanaging the database.
- To develop an understanding of essential DBMS concepts such as: database secure integrity and concurrency.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To understand the basic concepts and the application of Database systems.
CO 2	To understand the basics of SQL and construct queries using SQL.
CO 3	To understand the Relational Database design principles.
CO 4	To apply various Normalization techniques for database design improvement.
CO 5	To apply concurrency control and recovery techniques during transaction execution.

UNIT – I

Introduction - Database-System Applications, View of Data, Database languages, Database architecture, Database Users and Administrators.

E-R Model - The Entity Relationship Model, Constraints, Entity Relationship Diagrams, and Extended E-R features.

UNIT – II

Relational Model - Structure of Relational Databases, Database Schema, Keys, QueryLanguages, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Modification of Database.

UNIT – III

Introduction to SQL - Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Complex queries, views, Modification of the Database.

Advanced SQL -Integrity Constraints, Dynamic SQL, Functions and Procedures.

OtherRelational Query Languages - Tuple Relational Calculus, Domain Relational calculus.

UNIT – IV

Normal Forms – Atomic domain and First Normal Form, Keys and Functional Dependencies, Second Normal Form, BCNF, BCNF and Dependency Preservation, Third Normal Form, Lossless Decomposition, Dependency- preserving, Multi valued Dependencies, Fourth Normal Form, Join Dependencies, Fifth Normal Form, and Inclusion dependencies.

UNIT – V

Transactions -Transaction Concept, Transaction State, Implementation of TransactionAtomicity and Durability, Concurrent Executions, Serializability.

Concurrency Control -Lock-Based Protocols, Timestamp-Based Protocols.
RecoverySystem - Failure Classification, Storage, Recovery and Atomicity, Log based recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan," Database system Concepts", 5thEdition, McGrawhill.

2. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", PearsonEducation, 3rd Edition, 2003

3. C.J.Date, "Introduction to Database", 8 Th Edition, 2003, Addison-Wesley publication.

4. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States 1st Edition, 2000

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base ManagementSystems.3rd Edition, Tata McGrawHill.

2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems,Cengage Learning, 1st Edition, 2011.

3. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2012.

4. S.K.Singh, "Database Systems Concepts, Design and Applications", First Edition,Pearson Education, 2006.

Reference Links:

1. https://nptel.ac.in/courses/106/105/106105175/ (IIT KHARAGPUR)

2. https://nptel.ac.in/courses/106/106/106106095/ (IIT MADRAS)

<table>
<tr><td>Course Title</td><td colspan="5">MATHEMATICAL STATISTICS FOR DATA SCIENCE & DATA ANALYTICS (R20)</td><td colspan="3">B. Tech.
Open Elective-II</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE603</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 minutes</td><td colspan="4">End Exam Duration: 3Hours</td></tr>
<tr><td colspan="9">Course Objectives:
• To help the students in getting a thorough understanding of the fundamentals of probabilities.
• To help the students in getting a thorough understanding and usage of statistical techniques like testing of hypothesis.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand and calculate the measures of dispersion</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze probability concepts</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply distributions in real life problems.</td></tr>
<tr><td>CO 4</td><td colspan="8">Justify hypothesis concepts</td></tr>
<tr><td>CO 5</td><td colspan="8">Estimate correlation and regression coefficients</td></tr>
</table>

UNIT I:
Introduction, Mean, Median, Mode, Skewness, Range

Learning Outcomes:
At the end of this unit, the student will be able to
- understand and calculate the measures of dispersion

UNIT II:
Probability Basics, Simple probabilities, Rule of addition, Rule of multiplication, Conditional Probability, Baye’s theorem.

Learning Outcomes:
At the end of this unit, the student will be able to
- analyze probability concepts

UNIT III:
Explaining basic concepts of Random Variables (Without Problems)- Probability Distributions: Binomial distribution**,** Poisson distribution**,** Normal distribution**,** Real life problems

Learning Outcomes:
At the end of this unit, the student will be able to
- apply distributions in real life problems.

UNIT IV:
Introduction, Hypothesis, Level of Significance, Type I and Type II errors, Confidence intervals for large Samples (only means and Proportions), Calculating sample size and power.
Learning Outcomes:

At the end of this unit, the student will be able to
- justify hypothesis concepts

UNIT V:
Introduction, Linear Regression, Correlation coefficient, Coefficient of determination, Root Mean Square Error.

Learning Outcomes:
At the end of this unit, the student will be able to
- estimate correlation and regression coefficients

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-42 edition.
2. Statistical Methods by S.P.Gupta, S Chand Publications
3. Probability and Statistics for Engineers, Johnson, Fifth edition, Prentice Hall of India.
4. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition-2013.

Reference Books:

1. Probability and Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publishers.
2. Probability and Statistics for Engineers and Scientists, Walpole and Myers, Seventh edition, Pearson Education Asia, 2002
3. An Introduction to Probability theory and its applications, William Feller
4. Engineering Mathematics by Srimanta Pal, Subodh C. Bhunia, Oxford University Press.

Course Title	BASICS OF ELECTRICAL, MAGNETIC AND OPTOELECTRONIC MATERIALS				OPEN ELECTIVE- II		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE608	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**
		3	**0**	**0**	**3**	40	60	100
					End Exam Duration: 3Hrs			

COURSE OBJECTIVES:

1.Students will be able to understand the fundamental concepts and applications of electrical, magnetic and optical properties of materials.
2.Apply a multi-disciplinary approach to plan, design, identify and address future needs of all the conventional and novel materials utilizing their properties for the society.

COURSE OUTCOMES: Upon completion of this course, the student will be able to:

CO1	**Obtain** knowledge about the electrical, magnetic and optoelectronic materials, their properties and applications
CO2	Successfully **apply** advanced concepts of materials engineering for the design, development and analysis of materials and devices.
CO3	**Develop** novel materials from the fundamental understanding of materials and apply them to societal needs.
CO4	**Analyze** the properties of superconductors.
CO5	**Identifies** the Engineering applications of electrical, magnetic and optoelectronic materials.

Unit – I: Electrical Materials

Introduction to electrical conduction–Dielectric constants – dielectric loss, dielectric breakdown, piezoelectricity and pyroelectricity.

Unit – II: Magnetic Materials

Introduction to dia, para, ferro, antiferro and ferri magnetism –Hysteresis loop–hard and soft magnetic materials- applications

Unit – III: Semiconducting Materials

Introduction to semiconducting materials – concept of doping – working principle of p-n junction diode, LED, Photo diode– solar cell – applications.

Unit – IV: Superconducting

Introduction to superconductors-Properties-Meissner effect-Type-1 &Ttype-II superconductors –BCS theory- high critical temperature (Tc)-applications.

Unit – V: Optoelectronic Materials

Introduction to Laser Principles – ruby, CO_2 lasers – applications of optoelectronic materials – introduction to optical fibers – light propagation –Fiber optic sensors-applications.

Text Books:

1. C. Kittel, Introduction to Solid State Physics, John Wiley and Sons, 7th edition,New Delhi, (2004).
2. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
3. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company

Reference Books:

1. V. Raghavan, Materials Science and Engineering, Prentice Hall of India, 5th edition, New Delhi, (2013).
2. B. G. Yacobi, Semiconductor Materials: An Introduction to Basic Principles, Springer, 1st edition, New York, (2013).
3. S. Kasap and P. Capper (eds.), Handbook of Electronic and Photonic Materials, Springer, New York, (2007).

<table>
<tr><td>Course Title</td><td colspan="5">Corrosion and Control</td><td colspan="3">B. Tech.
(Open elective-II)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE609</td><td rowspan="2">Open Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• To review the fundamental aspects of electrochemistry.
• It also focuses on various forms of corrosion, and their impact on life of metallurgical components, means and ways to engineer corrosion</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Recall the concepts of corrosion and its mechanism.</td></tr>
<tr><td>CO 2</td><td colspan="8">Explore different forms of corrosion and its mechanisms & prevention methods.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze different factors which influence corrosion in different medium</td></tr>
<tr><td>CO 4</td><td colspan="8">Identify different control methods for efficient control of corrosion</td></tr>
<tr><td>CO 5</td><td colspan="8">Discuss corrosion aspects which will enable them to apply for modern engineering technology</td></tr>
</table>

Unit-1: Introduction

Introduction to corrosion, definition and types of Corrosion (Chemical- & Electrochemical Corrosion-Evolution of Hydrogen gas & Absorption of Oxygen) & its mechanisms, Pilling Bed worth Rule , Galvanic series & its applications, Factors influencing corrosion-Metal & environment..

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain the types of corrosion.
- Identify the factors which influence corrosion.

Unit-2: Corrosion& Various phenomenon

Uniform Corrosion (definition, mechanism & prevention), Galvanic (Two-metal) Corrosion (Definition, mechanism & prevention), Pitting corrosion (Definition, mechanism & prevention), Concentration Cell Corrosion (Definition, mechanism & prevention),Differential aeration method (Definition, mechanism & prevention)

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain the mechanisms and prevention methods of different forms of corrosion.
- Analyze the differences between pitting and galvanic corrosion.

Unit-3: Environmental Factors on Corrosion

Various factors that influence Corrosion- Corrosion in water and aqueous solution, microbiologically induced corrosion, corrosion in acidic and alkaline medium.

Learning Outcomes:

At the end of the unit, The students will be able to

- discuss various environmental factors which influence the corrosion

Unit-4: Prevention & Control

Basic principle & concepts of prevention of corrosion-Cathodic protection (Sacrificial anodic protection, Impressed current Cathodic protection), Electroplating & Electroless plating-Definition with examples (Nickel & Copper), advantages - Alternation of Environment.

Learning Outcomes:

At the end of the unit, The students will be able to

- explain the prevention methods of corrosion
- discuss the basic concepts of electroplating and electroless plating

Unit-5: Modern theory and applications of corrosion:

Introduction, Gibb's free energy, cell potentials, EMF series, Corrosion rate expressions, Importance of corrosion in engineering technology & industrial applications.

Learning Outcomes:

At the end of the unit, The students will be able to

- Analyze the rate of corrosion
- Explain the importance of Electrochemical series

Textbooks:

1. Text Book of Engineering Chemistry, Shashi Chawla, Dhanapath Rai Publications, New Delhi, 4th Edition, 2011.
2. Corrosion of metals, Helmut Kaesche, Springer Publications
3. Handbook of Corrosion Engineering, 3rd edition, Pierre R. Roberg, McGraw Hill publications
4. General Chemistry for Engineers, Jeffrey S. Gaffney & Nancy A. Marley, Elsevier publications

REFERENCES:

1. Corrosion engineering, Fontana Mars G, Mc Graw Hill publications
2. A Text Book of Engineering Chemistry, Jain and Jain, Dhanapath Rai Publishing Company, New Delhi, 15th Edition, 2010
3. Corrosion and chemical resistant masonry materials Handbook, Walter T.V. Sheppard Lee, Building materials series.
4. General chemistry by Ebbing Darrell, Himalaya Publications

<table>
<tr><td>Course Title</td><td colspan="5">Academic Writing</td><td colspan="3">OPEN ELECTIVE – II</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE615</td><td rowspan="2">HUM</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

COURSE OBJECTIVES	
1	Demonstrate and apply knowledge of basic essay structure, including introduction, body and conclusion;
2	Employ the various stages of the writing process, including pre-writing, writing and re-writing
3	Identify effective writing techniques in his or her own work and in peer writing.
4	Improve academic and idiomatic vocabulary;
5	Understand the importance of academic writing and avoid the plagiarism

COURSE OUTCOMES	
CO1	Engage with readings critically by evaluating the various contexts (social, historical, or personal) surrounding and underpinning each text
CO2	Effectively summarize and analyze various texts while identifying and highlighting their main ideas and messages
CO3	Develop independent perspectives and arguments via persuasive support and successful incorporation of research thus developing their own voice and creating a balance between their own voice and source summaries
CO4	Practice the revision skills necessary for the accomplishment of a writing project
CO5	Constructively critique their own and peers' writing, with an awareness of the collaborative and social aspects of the writing process

UNIT 1
Academic Writing
Definition- Difference between Academic and Non-academic writing – Four types of academic writing – The 4Cs of Academic Writing- Essentials of a well-structured academic writing- (Introduction, Explanation, Illustration and Conclusion)
UNIT 2
Paragraph structure
Topic sentence - supporting examples - transition sentence- Basic rhetorical modes Narration- description – exposition
UNIT 3
Writing Process and strategy
Writing Process and strategy research, planning, summarizing, organizing, plagiarism, referencing, proofreading
UNIT 4
Structure of research paper
Structure of research paper (organizing the document, transition, data implementation and display)

UNIT 5

Writing Vocabulary and language

Writing Vocabulary and language (precision, clarity, conciseness, academic vocabulary, word choice)

Text Books:

1. Hairston, et al. The Scott, Foresman Handbook for Writers (San Francisco: Longman 2002 or latest edition)

2. Stephen Bailey Academic Writing: A Handbook for International Students

Reference Books:

3. A Short Guide to College Writing, 5th edition, by Barnet, Bellanca, and Stubbs.
4. Power of Habit by Charles Duhigg. Random House Trade Paperbacks. ISBN: 978-0-8129-8160-5. Available at the IVC bookstore. You MAY use hard copy or digital version.
5. Writing Clearly: Grammar for Editing 3rd Ed. by Janet Lane & Ellen Lange. Heinle Cengage Learning, 2012 ISBN 978-1-111-35197-7. Available at the IVC bookstore.

<table>
<tr><td>Course Title</td><td colspan="4">Basics of Financial Management for Engineers</td><td colspan="3">B. Tech.
Open Elective - II</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE611</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 90 Min</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objective:

- Provide an in-depth view of the process in financial management.
- Develop knowledge on the allocation, management and funding of financial resources.
- Improving students' understanding of the time value of money concept and the role of a financial manager in the current competitive business scenario.
- Enhancing student's ability in dealing short-term dealing with day-to-day working capital decision; and also longer-term dealing, which involves major capital investment decisions and raising long-term finance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Knowledge of the basics of Financial Management Concepts.
CO 2	To learn the concept of cost of capital and making decisions regarding raising of capital
CO 3	To understand the concept of Capital structure evaluation and related decisions.
CO 4	To build knowledge about financing and estimation of Working capital management.
CO 5	To understand the concepts of TVM, capital budgeting decisions and evaluation of Projects.
CO 6	Understanding of mergers, acquisitions and various other types financial restructurings

Unit I

Introduction to Financial Management - Concept of Business Finance, Functions of Finance, scope of Finance, Role of a Finance Manager, Goals , objectives of Financial Management, Functional areas.

Unit II

Cost of Capital - Long Term sources of finance, Concept, meaning & importance, Opportunity Cost of capital, Cost of different sources of finance, Weighted average cost of capital, factors affecting cost of capital.

Unit III

Budgeting: budgets, purpose, budgetary control, preparation of budgets, master budget, fixed and flexible Budgeting.

Unit IV

Working Capital Management - Concept of working capital, significance, types of working capital, Factors affecting working capital needs, financing approaches for working capital, working capital estimation and calculation.

Unit V

Capital Budgeting Decision - Time Value of Money, Capital budgeting - Introduction, techniques of capital budgeting -Pay Back Method, Accounting Rate of Return, Net Present Value, Profitability Index, and Internal Rate of Return.

Text Book:

1. Financial Management by Dr. R. P. Rustagi, Taxmann's Publication.
2. Financial Management: Principles and Applications by Pearson Education; Thirteenth edition, Sheridan Titman,
3. Financial Management by I M Pandey, Pearson Education; Twelfth edition.
4. Fundamentals of Financial Management by Eugene F. Brigham, Joel F. Houston, Brigham Houston, seventh edition.
5. Financial Management Theory and Practice by Michael C. Ehrhardt and Eugene F. Brigham, Publisher, Joe Sabatino.

Reference Books:

1. Financial Management: Theory & Practice by Eugene F. Brigham and Michael C. Ehrhardt; Cengage Learning; 15 edition.
2. Fundamentals of Financial management by Dr. Eugene Brigham and Dr. Joel F.Houston: Cengage learning, Philippine Edition.
3. Financial Management Principles and practice by G. Sudarsana Reddy, Himalaya Publishing House.
4. Financial Management by Khan & Jain, Tata Mcgraw Hill.
5. Financial Management by Dr. P C Tulsian, S Chand.
6. Financial Management by Ravi Kishore, Taxmann.

Course Title	Artificial Intelligence (Professional Elective Course-II)				B.Tech VI Sem (R20) CSE		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2005604	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To understand how a computer making intelligent decisions.
- To understand the notions of state space representation, heuristic search methods.
- To learn different knowledge representation techniques
- To understand the applications of AI.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Given a search problem, analyze and formalize the problem (as a state space, graph, etc.).
CO 2	The ability defines admissible and consistent heuristics and completeness and optimality.
CO 3	Analyze and Apply knowledge representation technique.
CO4	Ability to understand uncertainty and Design appropriate Bayes Nets corresponding to the causal relationships and conditional independence of a real world situation
CO5	Design good evaluation functions and strategies for game playing and Understand concept of natural language processing.

UNIT-I:

Introduction to AI: AI Problems History what is an AI Technique. Problem, Problem Space and Search, Heuristic Search Techniques.

UNIT-II:

Knowledge Representation Issues, Predicate Logic, Knowledge Representation using rules.

UNIT –III:

Symbolic reasoning under Uncertainty, Bayesian Networks.

UNIT-IV:

Weak Slot Filler Structures, Strong Slot and Filler Structures, Knowledge Representation summary.

UNIT –V:

Game Playing, Planning, Natural Language processing.

Text Books:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.
3. *Philip C Jackson,* Introduction to Artificial Intelligence: Second, Enlarged Edition.
4. Saroj Kaushik. Artificial Intelligence. Cengage Learning, 2011.

Reference Books:

1. Charu C. Aggarwal,Artificial Intelligence,Springer,2021.
2. Adelyn Zhou, Mariya Yao and Marlene Jia Applied Artificial Intelligence: A Handbook for Business Leaders, 2017
3. Peter Norvig, Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp.
4. Dr. Dheeraj Mehrotra,Basics of Artificial Intelligence & Machine Learning
5. Chandra S.S.V,Artificial Intelligence and Machine Learning
6. Denis Rothman, Artificial Intelligence by Example

<table>
<tr><td>Course Title</td><td colspan="4">Software Testing
(Professional Elective Course -II)</td><td colspan="4">B.Tech VI Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005605</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Study the concepts of Software Testing objectives, Complications of bugs and Types of bugs.
- Learn various testing methodologies.
- Identify the techniques and skills on how to use modern software testing tools to support software testing projects.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Recall Software Testing.
CO 2	Compare various Terminologies used in Software Testing.
CO 3	Understand various testing methodologies like Path Testing, Domain Testing, Logic based Testing and Tools (Win-runner testing Tool).
CO 4	Construct various graphs useful in Software Testing like Flow Graph, State Graph.
CO 5	Examine various testing strategies and categorize them.

UNIT - I

Introduction: Purpose of testing, Dichotomies, Model for testing, Consequences of Bugs, Taxonomy of bugs.

Flow graphs and Path testing: Path testing basics, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of path testing.

UNIT - II

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques.

Dataflow testing: Basics of dataflow testing, Strategies in dataflow testing, Application of dataflow testing.

UNIT - III

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain Testing, Domains and Interfaces Testing, Domains and Testability.

Paths, Path products and Regular expressions: Path products & Path expression, Reduction Procedure, Regular Expressions & Flow Anomaly Detection.

UNIT - IV

Logic Based Testing: Overview, Decision Tables, and Path Expressions and specifications.

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.

UNIT - V

Graph Matrices and Application: Matrix of Graph, Power of a Matrix, Node Reduction Algorithm.

Text Books:

1. Software Testing techniques, Boris Beizer, Dreamtech, Second Edition.
2. Software Testing, N.Chauhan, Oxford University Press.
3. The craft of software testing - Brian Marick, Pearson Education.
4. Foundations of Software Testing, D.Graham and Others, Cengage Learning.

Reference Books:

1. Software Testing, Third Edition, P.C.Jorgensen, Aurbach Publications (Dist.by SPD).
2. Introduction to Software Testing, P.Ammann and J.Offutt, Cambridge Univ. Press.
3. Effective methods of Software Testing, Perry, John Wiley, Second Edition, 1999.
4. Software Testing Concepts and Tools, P.Nageswara Rao, Dreamtech Press.
5. Software Testing, M.G.Limaye, TMH.
6. Software Testing Tools, Dr.K.V.K.K.Prasad, Dreamtech.

<table>
<tr><td>Course Title</td><td colspan="4">Adhoc & Sensor Networks
(Professional Elective course-II)</td><td colspan="3">B.Tech VI Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005606</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Learn the different types of MAC protocols.
- Be familiar with different types of ad hoc routing protocols.
- Be expose to the TCP issues in ad hoc networks.
- Learn the architecture and protocols of wireless sensor networks.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the concepts, network architectures and applications of adhoc and wireless sensor networks.
CO 2	Analyze the protocol design issues of adhoc and sensor networks.
CO 3	Design routing protocols for adhoc systems.
CO4	Develop wireless sensor networks with respect to some protocol design issues.
CO 5	Evaluate the QoS related performance measurements of ad hoc and sensor networks.

UNIT - I

INTRODUCTION: Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT - II

MAC PROTOCOLS FOR ADHOC WIRELESS NETWORKS:

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT – III

ROUTING PROTOCOLS AND TRANSPORT LAYER IN ADHOC WIRELESS NETWORKS 9:

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT – IV

WIRELESS SENSOR NETWORKS (WSN) AND MAC PROTOCOLS 9

Single node architecture: hardware and software components of a sensor node – WSN

Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT – V

WSN ROUTING, LOCALIZATION & QOS 9:

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization- Transport Layer issues.

Text Books:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks:Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Jing (Selina) He, Mr. Mr. Shouling Ji, Yingshu Li, Yi Pan, "Wireless Ad Hoc and Sensor Networks", CRC Press.
3. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.

Reference Books:

1. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
2. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", "Wiley",2005

<table>
<tr><td>Course Title</td><td colspan="5">IOT Lab</td><td colspan="3">B. Tech. VI Sem CSE (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005607</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Student should get the knowledge of Python and Eclipse background.
● Student should get the knowledge of Control statements in python
● Student should get the knowledge of Arduino.
● Student should get the knowledge of Raspberry Pi</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Student will be aware of Python and Eclipse background.</td></tr>
<tr><td>CO 2</td><td colspan="8">Student will develop basic programs in python</td></tr>
<tr><td>CO 3</td><td colspan="8">Student will get knowledge on Arduino IDE and Arduino Board</td></tr>
<tr><td>CO 4</td><td colspan="8">Student will get knowledge on Raspberry Pi</td></tr>
</table>

IoT Experiments:-

1. Study and Install IDE of Arduino and different types of Arduino.
2. Digital Output (Blinking of LED)
3. Digital Input (Push Button)
4. Analog Output (Fading)
5. Communication between Computer and Arduino.
6. Displaying messages on LCD
7. Traffic Controller
8. Night Light Simulation using LDR and PVR
9. Fire Alert.
10. Study and Configure Raspberry Pi
11. Write a Program for LED blink using Raspberry Pi
12. Write a Program for LED blink using Switch with Raspberry Pi

<u>Text Books</u>:

1. Adrian McEwen, Hakin Cassimally “Designing the Internet of Things” Wiley India.
2. Getting Started with Arduino, 3rd Edition, Massimo Banzi and Michael Shiloh
3. Getting Started with Raspberry Pie, Matt Richardson & Shawn Wallace, O’Reilly-2014.
4. ArshdeepBahga, Vijay Madisetti “ Internet of Things(A hands on approach)” 1STedition, VPI publications,2014.

<u>Reference Books</u>:

1. Raj Kamal, “Internet of Things”, McGraw Hill, 1st Edition, 2016.
2. Internet of Things, Surya Durbha, Jyothi Joglekar, Oxford Higher Education.
3. The Internet of Things, Michael Miller, Pearson.
4. The Internet of Things, Samuel Greengard, The MIT Press Ltd.

<table>
<tr><td>Course Title</td><td colspan="5">Data Mining Lab</td><td colspan="3">B. Tech. VI Sem CSE (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005608</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● The different data mining models and techniques will be discussed in this course.
● Data mining and data warehousing applications in bioinformatics will also be explored.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the data mining process and important issues around data cleaning, pre-processing and integration.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.</td></tr>
</table>

Credit Risk Assessment

Description: The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the banks profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.

To do the assignment, you first and foremost need some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable text book on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

The German Credit Data:

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. credit dataset (original) Excel spreadsheet version of the German credit data (Down load from web).

In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset

• DM stands for Deutsche Mark, the cents Canadian (but looks and acts like a quarter).
• Owns telephone. German phone rat so fewer people own telephones.
• foreignhere_areworkermillionsofthese. Tin Germany (many from Turrkey). It is very hard to get German citizenship if you were not born of German parents.
• There are 20 attributes used in the classify the applicant into one of two categories, good or bad.

Subtasks : (Turn in your answers to the following tasks)

1. List all the categorical (or nominal) attributes and the real-valued attributes separately.
2. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes.
3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly ? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy ?
5. Is testing on the training set as you did above a good idea ? Why or Why not ?
6. One approach for solving the problem encountered in the previous question is using cross validation ? Describe what is cross-validation briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease ? Why ? (10 marks)

Text Books:

1. Data Mining: Concepts and Techniques, Jiawei Han , MichelineKamber and Jian Pei, Morgan Kaufmann Publishers, Elsevier, Third Edition,2012.
2. Data Warehousing in the Real world, Sam Aanhory& Dennis Murray , Pearson Education, Asia.
3. Intelligent Data Mining, Da Raun.Guoquing Chen, Etienne E. Kerre. Geert Wets, Springer.
4. Data Mining & Data Warehousing: Principles and Practical Techniques, Parteek Bhatia, Cambridge.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Insight into Data Mining, K.P.Soman, S.Diwakar , V.Ajay, PHI2008.
3. Data Mining: Introductory and Advanced Topics, Margaret H. Dunhan, Pearson.
4. Data Mining, Vikram Pudi, P. Radha Krishna, Oxford Higher Eduction.

<table>
<tr><td>Course Title</td><td colspan="4">Network Security Lab</td><td colspan="3">B. Tech. VI Sem CSE (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005609</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
- To Identify basic security attacks and services.
- To explain various approaches to Encryption techniques, Digital Signatures.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Identify the security issues in data transmission over computer network and resolve it.
CO 2	Implementation of various types of Encryption techniques.
CO 3	Implementation of Digital Signature schemes.
CO 4	Understanding functionality of Intrusion Detection System.

List of Experiments:

1. Perform encryption and Decryption using Substitution technique Caesar Cipher.
2. Perform encryption and Decryption using Substitution technique Playfair Cipher.
3. Perform encryption and Decryption using Substitution technique Hill Cipher.
4. Perform encryption and Decryption using Substitution technique Vigenere Cipher.
5. Perform encryption and Decryption using Transposition technique Railfence Cipher.
6. Perform encryption and Decryption using Transposition technique row-column transformation Cipher.
7. Perform encryption and Decryption using Block Cipher Data Encryption Standard.
8. Perform encryption and Decryption using Public Key Encryption technique RSA.
9. Implement the Key Exchange technique Diffie-Hellman Algorithm.
10. Implement Digital Signature technique MD5.
11. Demonstrate encryption and Decryption using Certificate Manager Kleopatra for GnuPG.
12. Demonstrate open source Intrusion Detection system.

Text Books:

1. Cryptography and network Security by Fourth edition, Stallings, PHI/Pearson
2. Cryptography & Network Security by Behrouz A. Forouzan, TMH.
3. Network Security: The complete reference by Robert Bragg, Mark Rhodes, TMH
4. Computer Security Basics by Rick Lehtinen, Deborah Russell & G.T.Gangemi Sr., SPD O'REILLY.

Reference Books:

1. Cryptography and network Security by Atul Kahate, 4th Edition, Tata McGraw Hill.
2. Understanding Cryptography, Christof Paar. Jan Pelzl, Springer.
3. Introduction to Modern Cryptography, Jonathan Katz, Yehuda Lindell, 2nd Edition, CRC Press.

<table>
<tr><td>Course Title</td><td colspan="4">Mobile Application Development / NASSCOM Courses</td><td colspan="3">B.Tech VI Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005610</td><td rowspan="2">Skill Oriented Course</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>0</td><td>0</td><td>4</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications. ·
- To understand fundamentals of android programming.
- To understand Kotlin programming.
- Utilizing the android components by using Kotlin language.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Develop applications using services and publishing android applications.
CO 2	To demonstrate their skills of using Android software development tools.
CO 3	Implementing Android programming with java to develop basic applications.
CO4	Installing Kotlin Software and utilizing.
CO5	Developing applications with kotlin.

LIST OF EXPERIMENTS:

1. Setting up the Development Environment
   1.1 Installation of JDK and Setting path
   1.2 Downloading and Installing Android Studio
2. Creating "Hello World" Application and viewing the output through emulator.
3. Creating the Application by using Activity class
   i) onCreate()
   ii) onStart()
   iii) onResume()
   iv) onPause()
   v) onStop()
   vi) onDestroy()
   vii) onRestart()
4. Create the Application using the Edit Text control.

5. Create the Application Choosing options.

i) CheckBox

ii) RadioButton

iii) Spinner

6. Create the applications using different layouts.

i) Linear Layout

ii) Relative Layout

iii) Absolute Layout

iv) Table Layout

7. Create the application for doing arithmetic operations. (Calculator)

8. Create the application to play the audio and video clips.

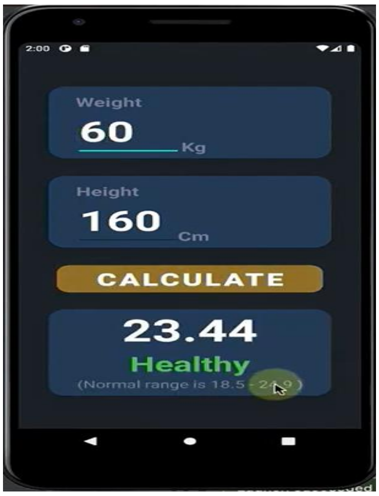
9. Create the application by using menus and action bar.

10. Sample Android applications using SQLite Database as a backend.

11. Installing Kotlin software.

12. Creating an android application in kotlin using EditText and Button controls.

13. Create an android app in Kotlin to find the health condition of the person.



Text Books:

1. Android Programming by B.M Harwani, Pearson Education, 2013.
2. T1. Lauren Darcey and Shane Conder, “Android Wireless ApplicationDevelopment”, Pearson Education, 2nd ed. (2011)
3. Android application Development for Java Programmers, James C Sheusi, CengageLearning 4. Android In Action by W.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz.,Dreamtech.

Reference Books:

1. Beginning Android 4 Application Development, by Wei-Meng Lee , Wiley India.
2. Android Programming for Beginners, John Horton, 2nd Edition, Packt.
3. Android App Development for Dummies, Michael Burton, 3rd Edition, Wiley.

Course Title	**Management Organizational Behaviour (Mandatory Course)**					**B.Tech VI Sem (R20) CSE**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20MC612	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	0	0	0	40	--	40
					End Exam Duration: 3Hrs			

Course Objectives:

- To aid students in understanding human behavior in organizations,
- To provide students with a comprehensive exposure to organizational behavior theories, research and workplace issues.
- The course also provides an overview of the theories and practices of management in organizational contexts.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Explain the Importance & Role of Management in the Organizations.
CO 2	Evaluate the different aspects related to Decision Making and Controlling Process
CO 3	Describe the different theories related to Individual behavior in the Organization
CO4	Analyze Group Behavioral influence in the Organization.
CO5	Evaluate the process and climate effects in Organization Behavior.

UNIT-I

Role of Management: Concept – Significance – Functions – Principles of Management - Patterns of Management: Scientific – Behavioural – Systems – Contingency.

UNIT-II

Decision Making & Controlling – Process – Techniques. Planning – Process – Problems — Making It Effective. Controlling - System of Controlling – Controlling Techniques – Making Controlling Effective.

UNIT-III

Individual Behaviour& Motivation – Understanding Individual Behaviour – Perception – Learning – Personality Types – Johari window- Transactional Analysis- Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg, David McClelland, and Porter and Lawler.

UNIT-IV

Group Behavior & Leadership: Benefits of Groups – Types of Groups – Group Formation and Development. Leadership and Organizational Culture and Climate: Leadership – Traits Theory – Managerial Grid – Transactional Vs Transformational Leadership – Qualities of good leader- Women Leadership in India.

UNIT-V

Organisational Behaviour: Organizing Process – Departmentation Types – Making Organizing Effective – Organisational culture- Types of culture – Organisational Culture VsOrganisational climate - Conflict management - Change Management .

Text Books:

1. Organisational Behaviour, Stephen P. Robbins, Pearson Education
2. Management and Organisational Behaviour, Subbarao P, Himalaya Publishing House
3. Principles of Management, Koonz,Weihrich and Aryasri, Tata McGraw Hill.

Reference Books:

1. Organisational Behaviour ,S.S.Khanka, S.Chand
2. OrganisationalBehaviour , Mishra .M.N ,Vikas
3. Management and Organisational behaviour, Pierce Gordner, Cengage.
4. Behaviour in Organizations, Hiriyappa .B.New Age Publications
5. Organisational Behaviour, Sarma, Jaico Publications.
6. Principles of Management ,Murugesan ,Laxmi Publications

B.Tech VII SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="4">Compiler Design
(Professional Elective Course-III)</td><td colspan="3">B.Tech VII Sem(R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005701</td><td rowspan="2">PCC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration:2Hours</td><td colspan="4">End Exam Duration:3Hrs</td></tr>
</table>

Course Objectives:

- To make the student to understand the process involved in compilation.
- Creating awareness among students on various types of parsers.
- Understand the syntax analysis, intermediate code generation, type checking, and the role of symbol table.

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Understand and analyze the various phases of Compiler.
CO2	Identify the tokens using lexical analyzer techniques.
CO3	Categorize and implement parsing techniques.
CO4	Understand syntax directed definition and develop type checking semantics using synthesized and inherited attributes.
CO5	Understand the storage allocation and intermediate code representations.
CO6	Summarize the code optimize techniques and demonstrate code generation technique and concepts.

UNIT-I

Introduction to Compiling: Compilers, Analysis of the Source program, the phases of a compiler, the cousins of the Compiler, grouping of phases, Compiler construction tools.

Lexical Analysis: The role of the analyzer. Input buffering, Specification of tokens, Recognition of tokens, A language for Specifying Lexical analyzer.

UNIT-II

Syntax Analysis: The role of the parser, Context-free grammars writing a grammar, Top down parsing, Bottom-up parsing, Operator-precedence parsing, LR parsers, Parser generators.

UNIT-III

Syntax Directed Translation: Syntax-directed definitions, Construction of syntax trees, S-attributed definitions, L-attributed definitions.

Type Checking: Type systems, Specification of simple type checker, Equivalence of type expressions, type conversions.

UNIT-IV

Run-Time Environments: Source Language issues, storage organization, Storage-allocation strategies, Access to non local names, Symbol tables.

Intermediate Code generation: Intermediate languages, three address code, quadruple, triple and indirect triple.

UNIT-V

Code Generation: Issues in the Design of a code generator, The target machine, Basic blocks and flow graphs, Next-use information, A simple code generator, Register allocation and assignment, DAG representation of basic blocks, peephole optimization.

Code Optimization: Introduction, the principle source of optimization.

Text Books:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, “Compilers-Principles, Techniques and Tools”, Pearson Education.
2. Alfred V.Aho, Jeffrey D.Ullman, “Principles of Compiler Design”, Narosa Publications.
3. M. Sreenivasulu, “Compiler Design”, Research India Publications.
4. K.V.N.Sunitha, “Compiler Construction”, Pearson Education.

Reference Books:

1. Muneeswaran, “CompilerDesign”, Oxforward university press
2. Nandini Prasad K S, “Principles of Compiler Design”, Cengage Publication.
3. Santanu Chattopadhyay “Compiler Design”, PHI.
4. M. Ganga Durga, T.G. Mani Kumar, “Principles of Compiler Design”, MJP Publishers.

<table>
<tr><td>Course Title</td><td colspan="4">Computer Graphics
(Professional Elective Course-III)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
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<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To apply the rules and algorithms in generating graphical outputs.
- To develop multi-dimensional objects using suitable transformations.
- To Develop real-time rendering graphics.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Classify CRT, Color CRT, DVST, Flat Panel display devices and Graphical Input Devices.
CO 2	Understand DDA, Bresenhams line drawing algorithms and Midpoint circle generating algorithms, clipping of polygons.
CO 3	Exemplify 2D & 3Dtranslation, rotation, reflection, scaling and shearing.
CO 4	Compare RGB, CMY,YIQ, CMYK Color models.
CO 5	Summarize types of animation, Animation sequence and morphing technique.

UNIT - I

Introduction: Usage of Graphics and their applications, Presentation Graphics- Computer Aided Design- Computer Art- Entertainment- Education and Training- Visualization- Image Processing Graphical User Interfaces.

Overview of Graphics systems: Video Display Devices- Raster Scan systems-random scan systems Graphics monitors and workstations-Input devices-hard copy devices- Graphics software.

UNIT - II

Scan Converting Lines – Basic Incremental algorithm, Midpoint algorithm and additional issues; Scan converting Circles, Scan Converting Ellipses, Solid Filling, Pattern Filling, Thick Primitives, Cohen – Sutherland line clipping algorithm, Parametric line clipping algorithms, Sutherland – Hodgeman polygon clipping algorithm, Generating characters.

UNIT - III

Geometrical transformations – 2D transformations, Homogeneous coordinates, Matrix representation of 2D transformations, Composition of 2D transformations, Window to view- port transformation, Matrix representation of 3D transformations, Composition of 3Dtransformations.

Representing Curves and Surfaces – Polygon meshes, Parametric cubic curves, Parametric bicubic surfaces and Quadratic surfaces.

UNIT - IV

Viewing in 3D – Projections, Specifying an arbitrary 3D view.

Solid Modeling – Representing Solids, Regularized Boolean set operations, Primitive instancing, Sweep Representation, Boundary Representations, Spatial-Partitioning Representations.

Achromatic and Colored Light – Achromatic light, Chromatic color, Color models for raster graphics, Reproducing color, Using color in computer graphics.

UNIT - V

Illumination Models – Ambient light, Diffuse reflection, Atmospheric attenuation.

Shading Models – Constant shading, Interpolated shading, Polygon mesh shading, Gouraudshading, Phong shading.

Animation – Conventional and Computer–Assisted animation, Animation languages,Methods of controlling animation, Basic rules of animation, Problems peculiar to animation.

Text Books:

1. Foley, Van Dam, Feiner and Hughes, Computer Graphics – Principles and Practice, 2nd Edition in C, Pearson Education, 2004
2. Donald Hearn and M. Pauline Baker, Computer graphics, C version, Prentice – Hall.
3. William M. Newman, Robert F. Sproull, Principles of interactive computer graphics, 12th Edition, McGraw – Hill, 1986.
4. David F. Rogers, Rae A. Earnshaw, Computer Graphics Techniques : Theory and Practice, Springer-Verlag, 1990.

Reference Books:

1. Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.
2. Fundamentals of Computer Graphics, Steve Marschner, Peter Shirley, 4th Edition, CRC Press.
3. Introduction to Computer Graphics:A Practical Learning Approach, Fabio Ganovelli, Massimiliano Corsini, Sumanta Pattanaik, Marco Di Benedetto, CRC Press.
4. Computer Gaphics, Amarendra N. Sinha, Arun D Uadi, Tata McGraw Hill.

Course Title	Cyber Security (Professional Elective Course-III)				B.Tech VII Sem (R20) CSE		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2005703	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To learn about cybercrimes and how they are planned
- To learn the vulnerabilities of mobile and wireless devices
- The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding the basic cyber security concepts.
CO 2	Classifying the international laws and cyber forensics.
CO 3	Remembering to cyber-crime.
CO 4	Recognizing cybercrime and cyber terrorism.
CO 5	Understanding the privacy issues.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles,Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
4. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press .

Reference Books:

1. Cyber Security Engineering: A Practical Approach for Systems and Software Assurance, Nancy R. Meade, Carol C. Woody, Addison Wesley.
2. The Cyber Security: Self help Guide, Arun Soni, CRC Press.
3. Cyber Security: Analytics, Technology & Automation, Martti Lehto, Pekka Neittaanmaki, Springer.
4. Cyber Security: Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, SYBEX.

<table>
<tr><td>Course Title</td><td colspan="5">Machine Learning
(Professional Elective Course -IV)</td><td colspan="3">B.Tech CSE VII Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005704</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 2 Hours</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To introduce students to the basic concepts and techniques of Machine Learning.
● To have a thorough understanding of the Supervised and Unsupervised learning techniques.
● To study the various probability-based and generalized learning techniques.
● To understand ensemble models of machine learning algorithms.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the machine learning concepts that are suitable for developing real time applications</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the concept of decision tree classifier and develop a model for a given problem.</td></tr>
<tr><td>CO 3</td><td colspan="8">Apply instant based learning to solve a real time problem.</td></tr>
<tr><td>CO 4</td><td colspan="8">Understand the concepts of probability and Bayes’s machine learning algorithms.</td></tr>
<tr><td>CO 5</td><td colspan="8">Evaluate different clustering algorithms.</td></tr>
</table>

UNIT–I

Introduction: Introduction to Machine Learning: Introduction, Different types of learning, Applications of Machine Learning, Parametric and Nonparametric Machine Learning Algorithms, Training and test sets, cross validation.

Linear Regression: Simple linear regression, steps in building a regression model, Building simple linear regression model, multiple linear regression, building multiple linear regression model.

UNIT–II

DecisionTreeLearning: Introduction,Decisiontreerepresentation,appropriate problems for decision tree learning, the basic decision tree algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning, Avoiding Over fitting the Data.

UNIT–III

Instance Based Learning: K nearest neighbor, the Curse of Dimensionality, Over fitting and Under fitting, Feature Selection: forward search, backward search, univariate, multivariate feature selection approach, Dimensionality Reduction, Linear Discriminant Analysis, Principal Component Analysis.

UNIT–IV

Probability and Bayes Learning: Brute-Force Bayes Concept Learning, Maximum Likelihood Hypothesis, Naïve Bayes Classifier, Logistic Regression, Support Vector Machine: Introduction, the Dual formulation, Maximum margin with noise, nonlinear SVM and Kernel function, Beyond Binary Classification.

UNIT– V

Evaluating Machine Learning algorithms and Model Selection, Ensemble Learning: Introduction, Bagging and boosting, Random forest. Clustering: Introduction, K-mean clustering, K-medoids clustering, Hierarchical clustering -Agglomerative clustering –Divisive clustering- Choosing the number of clusters.

Text Books:

1. Tom M.Mitchell, "Machine Learning", Tom M.Mitchell, McGraw-Hill
2. Manaranjan Pradhan, U Dinesh Kumar, " Machine Learning using python", Wiley Publications
3. KevinMurphy, "Machine Learning: A Probabilistic Perspective", MITPress,2012
4. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer,2007

Reference Books:

1. Andrews C Muller, Sarah Guido, "Introduction to Machine Learning with Python", OReilly Publications,
2. Stephen Marshland, "Machine Learning: An Algorithmic Perspective", Taylor & Francis
3. Peter Flash, Cambridge, "Machine Learning: The Art and Science of Algorithms That Make Sense of Data", University Press
4. Trevor Hastie, Robert Tibshi rani, Jerome Friedman, "The Elements of Statistical Learning", Springer, 2009.

<table>
<tr><td>Course Title</td><td colspan="4">Object Oriented Analysis & Design
(Professional Elective Course-IV)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005705</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To understand the Object-oriented life cycle.
- To know how to identify objects, relationships, Services and attributes through UML.
- To understand different UML diagrams.
- To know object-oriented design process, software quality and usability.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Design software applications and document them using UML class diagrams
CO 2	Analyze, design, document the requirements through use case driven approach.
CO 3	Identify analyses, and model structural and behavioral concepts of the system.
CO 4	Apply the concepts of architectural design for deploying the code for software.
CO 5	Develop, explore the conceptual model into various scenarios and applications.

UNIT - I

Introduction to UML: Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual Model of the UML, Architecture.

UNIT - II

Basic Structural Modeling: Classes, Relationships, Common Mechanisms, and Diagrams Interfaces, Types and Roles, Packages.

Class and Object Diagrams: Terms, Concepts, Modeling Techniques for Class and Object Diagrams.

UNIT - III

Basic Behavioral Modeling-I: Interactions, Interaction Diagrams.

Basic Behavioral Modeling-II: Use Cases, Use Case 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, Systems and Models.

Case Study: The Unified Library Application.

Text Books:

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
3. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Pearson Education.
4. Modeling Software Systems Using UML2, Pascal Roques, Wiley- Dreamtech India Pvt. Ltd.

Reference Books:

1. Object Oriented Analysis and Design, Atul Kahate, The McGraw- Hill Companies.
2. Object-Oriented Analysis and Design with the Unified Process, John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.
3. Learning UML 2.0, Russ Miles and Kim Hamilton, O'Reilly, SPD.
4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.
5. UML and C++, R.C.Lee and W.M.Tepfenhart, PHI.
6. Object Oriented Analysis, Design and Implementation, B.Dathan and S.Ramnath, Universities Press.
7. OO Design with UML and Java, K.Barclay, J.Savage, Elsevier.
8. Mark Priestley: Practical Object-Oriented Design with UML, TMH.

<table>
<tr><td>Course Title</td><td colspan="4">Natural Language Processing
(Professional Elective Course-IV)</td><td colspan="3">B. Tech. VII Sem CSE (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
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<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Understand approaches to syntax and semantics in NLP.
- Understand current methods for statistical approaches to machine translation.
- Understand language modeling.
- Understand machine learning techniques used in NLP.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the fundamentals required for Computational Linguistics
CO 2	Understand the concepts of Language design, Text Transformer and their Products
CO 3	Have the clear idea of language specifications using context and free grammars
CO 4	Understand machine learning techniques used in NLP

UNIT I

Introduction to Natural Language Understanding, Syntactic Processing: Grammars and Parsing.

UNIT II

Features and Augmented Grammars, Toward Efficient Parsing, Ambiguity Resolution.

UNIT III

Statistical Methods: Probabilistic Context-Free Grammars, Best-First Parsing.

UNIT IV

Semantic Interpretation: Linking Syntax and Semantics, Ambiguity Resolution, other Strategies for Semantic Interpretation.

UNIT V

Context and World Knowledge: Using World Knowledge, Discourse Structure, Defining a Conversational Agent.

Text Book:

1. Natural Language Understanding – James Allen, Second Edition, Pearson Education.
2. Speech and Language Processing – Daniel Jurafsky, James H.Martin.
3. Foundations of Statistical Natural Language Processing – Christopher Manning, Hinrich Schutze, MIT Press.
4. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

Reference Books:

1. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2013-2014
2. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.
3. Introduction to Natural Language Processing,Jacob Eisenstein, MIT Press.
4. Natural Language Processing In Action, Hobson Lane, Cole Howard & Hannes Max Hapke, Manning Publications.

<table>
<tr><td>Course Title</td><td colspan="4">Cloud Computing
(Professional Elective Course -V)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005707</td><td rowspan="2">PEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To explain the history of different computing paradigms.
- To Know about issues and virtualization in cloud.
- To introduce the various levels of Cloud Services and applications that can be achieved by the cloud.
- To know about cloud access and security issues.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Recall different Computing Paradigms and overview of cloud computing.
CO 2	Understanding the Cloud Computing Architecture, network connectivity and cloud migration strategy.
CO 3	Explain and characterize different cloud deployment models, service models and virtualization.
CO 4	Understanding Programming models and Software Development in Cloud Computing.
CO 5	Understanding Cloud Service Providers Google Web Services, AWS and Microsoft cloud Services.

UNIT-I

Computing Paradigms:

High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Cloud Computing Fundamentals:

Motivation for Cloud Computing: The Need for Cloud Computing. Defining Cloud Computing: NIST Definition of Cloud Computing, Computing Is a Service, Cloud Computing Is a Platform. Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models, Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

UNIT-II

Cloud Computing Architecture and Management: Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-III

Cloud Deployment Models: Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

Virtualization: Introduction, Virtualization opportunities, Approaches to Virtualization, Hypervisors, From Virtualization to cloud computing.

UNIT-IV

Programming Models in Cloud: Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka

Software Development in Cloud: Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology.

UNIT-V

Cloud Services : Using Google Web Services – Exploring Google toolkit, Google APIs, Using Amazon Web Services – Understanding AWS, AWS Components and Services, Working with the Elastic Compute Cloud (EC2), Amazon Storage Systems, Amazon Database Services, Using Microsoft Cloud Services – Exploring Microsoft Cloud Services, Defining the Windows Azure Platform.

Text Books:

1. Barrie Sosinsky, "Cloud Computing Bile" ,Wiley publishing.
2. Judith Hurwitz, R Bloor, M.Kanfman, F.Halper "Cloud Computing for Dummies", Wiley India Edition, First Edition.
3. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley Publication,2011.
4. K.Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015.

Reference Books:

1. Danielle Ruest and Nelson Ruest, "Virtualization: A Beginners's Guide", McGraw Hill,2009.
2. Tom White, "Hadoop: The Definitive Guide", O'RIELLY Media 2009.
3. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.

<table>
<tr><td>Course Title</td><td colspan="4">Deep Learning
(Professional Elective Course -V)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005708</td><td rowspan="2">PE C</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● Study the neural networks and convolutions networks and their architecture.
● Gain knowledge about recurrent neural networks and deep supervised learning methods.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the neural networks to solve the real time problems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand convolutional neural networks and their architectures.</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand recurrent neural networks and recursive NNs.</td></tr>
<tr><td>CO 4</td><td colspan="8">Understand Deep supervised learning methods.</td></tr>
<tr><td>CO 5</td><td colspan="8">Implement the Deep Learning models in various Applications.</td></tr>
</table>

UNIT - I

Introduction: Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation, vanishing gradient problem, ways to mitigate it. RelU Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

UNIT - II

Convolutional Neural Networks : Architectures, convolution / pooling layers.

UNIT - III

Recurrent Neural Networks: LSTM, GRU, Encoder Decoder architectures Recursive neural network (RNN).

UNIT - IV

Deep Unsupervised Learning: Auto encoders (standard, sparse, denoising, contractive, etc), Variational Auto encoders, Adversarial Generative Networks, Autoencoder and DBM Attention and memory models, Dynamic memory networks.

UNIT - V

Applications of Deep Learning to NLP/Computer Vision: Introduction to NLP and Vector Space Model of Semantics, Word Vector representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Named Entity Recognition, Opinion Mining using Recurrent Neural Networks, Sentence Classification using Convolutional Neural Networks. Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, Video to text with LSTM models. Attention models for computer vision tasks.

Text Books:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book. (2015).
2. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner's Approach, OReilly, 2017.
3. Jeff Heaton, Deep Learning and Neural Networks, Heaton Research Inc, 2015.
4. Mindy L Hall, Deep Learning, VDM Verlag, 2011.

Reference Books:

1. Introduction to Deep Learning, Eugene Charniak, The MIT Press.
2. Deep Learning, D. Kelleher, The MIT Press.
3. Dive into Deep Learning, Joanne Quinn, Joanne McEachen, Michael Fullan, Mag Gardner, Max Drummy, Corwin.

<table>
<tr><td>Course Title</td><td colspan="5">Computer Vision
(Professional Elective Course -V)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005709</td><td rowspan="2">PE C</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To introduce the fundamentals of image formation.
To introduce the major ideas, methods, and techniques of computer vision and pattern recognition.
To develop an appreciation for various issues in the design of computer vision and object recognition systems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Identify basic concepts, terminology, theories, models and methods in the field of computer vision.</td></tr>
<tr><td>CO 2</td><td colspan="8">Describe known principles of human visual system.</td></tr>
<tr><td>CO 3</td><td colspan="8">Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.</td></tr>
</table>

UNIT-I

Image Formation Models: Monocular imaging system, Orthographic& Perspective Projection, Camera model and Camera calibration, Binocular imaging systems.

UNIT-II

Image Processing and Feature Extraction: Image representations (continuous and discrete), Edge detection.

UNIT-III

Motion Estimation: Regularization theory, Opticalcomputation, StereoVision, Motionestimation, Structure from motion.

UNIT-IV

Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medialrepresentations, Multiresolution analysis.

UNIT-V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition.

Text 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. Richard Szeliksy "Computer Vision: Algorithms and Applications" (http://szeliski.org/Book/).
3. Haralick& Shapiro, "Computer and Robot Vision", Vol II.

Reference Books:

1. G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision".
2. Emanuele Trucco and AllessandroVerri "Introductory Techniques for 3-D Computer Vision", Prentice Hall, 1998.
3. Olivier Faugeras, "Three-Dimensional Computer Vision", The MIT Press, 1993.

Course Title	**Repair & Rehabilitation of Structures**					**B.Tech CE VII Sem (R20)**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE107	**Open Elective (OEC III)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 1.5 Hrs						**End Exam Duration: 3 Hrs**		

Course Objectives:
To impart knowledge on the distress in structures.
To Understand the basic concepts of deterioration of structures.
To Understand the serviceability and durability aspect of structures.
Learning the materials used for retrofitting technique.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the cause of deterioration of concrete structures.
CO 2	Able to assess the damage for different type of structures.
CO 3	Summarize the principles of repair and rehabilitation of structures.
CO 4	Recognize ideal material for different repair and retrofitting technique.
CO 5	Know the artificial polymers and rust eliminators used for retrofitting works.

UNIT – I
Introduction
Definition for Repair, Retrofitting, Strengthening and rehabilitation.Physical and Chemical Causes of deterioration of concrete structures.

UNIT – II
Damage Assessment
Purpose of assessment, Rapid assessment, Investigation of damage, Chemical and Physical damages, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non- destructive, and semi destructive testing systems.

UNIT – III
Influence of Various Elements on Serviceability and Durability
Effects due to climate, temperature, moisture, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking.

UNIT – IV
Materials for Repair and Retrofitting
Artificial fiber reinforced polymer like CFRP, GFRP,AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes andmortars, concrete chemicals, special elements for accelerated strength gain.

UNIT – V
Maintenance and Retrofitting Techniques
Importance of Maintenance. Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique.

Text Books:

1. Sidney, M. Johnson, “Deterioration, Maintenance and Repair of Structures”
2. Denison Campbell, Allen & Harold Roper, “Concrete Structures – Materials, Maintenanceand Repair”- Longman Scientific and Technical.
3. Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press,1991
4. Concrete repair and maintenance Illustrated by Peter.H.Emmons, Galgotia publicationsPvt. Ltd., 2001.

Reference Books:

1. R. T. Allen and S.C. Edwards, “Repair of Concrete Structures”-Blakie and Sons Raiker R.N., “Learning for failure from Deficiencies in Design, Construction and Service”- R&DCenter (SDCPL).
2. M. S. Shetty, Concrete Technology – Theory and Practice, S. Chand & Co. Ltd., NewDelhi.
3. Failures and repair of concrete structures by S.Champion, John Wiley and Sons, 1961
4. Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House,2010.

<table>
<tr><td>Course Title</td><td colspan="4">Geo-Environmental Engineering</td><td colspan="3">B.Tech CE VII Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE108</td><td rowspan="2">Open Elective (OEC III)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To make the students to learn the concepts of geo-environmental engineering, planning and design of waste in landfills, ash ponds and tailing ponds.
To make the students to understand the effects of pollutants on soil properties
To give awareness about the adverse effects of soil and ground water contaminants
To analyze and apply various techniques for remediation of the contaminants
To make the student to understand the reuse of waste materials in geotechnical constructions.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the different types of contaminants and their effects on subsurface soils</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the waste contaminants and design the landfill</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand the environmental impacts due to the contaminants of slurry waste</td></tr>
<tr><td>CO 4</td><td colspan="8">Adopt the type of barriers to protect the earth from different contaminants</td></tr>
<tr><td>CO 5</td><td colspan="8">Understand the engineering properties of the waste material and reuse in the construction</td></tr>
</table>

UNIT – I

Introduction

Industrialization and Urbanization, Pollution, Control, and remediation.

Contamination

Surface contamination, Contamination transport, Soil-a Geotechnical trap, Effect of subsurface contamination, Detection of polluted zone

UNIT – II

Contaminants of Solid Waste in Landfills

Waste contaminants, landfills, types, shape, and size of landfills. Liner and liner system, Cover and cover system, Stability of landfills.

UNIT – III

Contaminants of Slurry Wastes

Slurry transported wastes, slurry ponds, operation, Embankment construction and raising, Environmental Impact, and control.

UNIT – IV

Vertical Barriers for Contaminant

Contaminated sites, Types of barriers, Soil-Bentonite slurry trench walls, Cement-Bentonite slurry trench walls and construction material

UNIT – V

Geotechnical Reuse of Waste Materials

Waste reduction, use in geotechnical construction, waste characteristics, transportation consideration, Waste material in Embankment and Fills.

Text Books:

1. Lakshmi N. Reddi and Hilary I. Inyang, "Geoenvironmental Engineering: Principles and Applications", CRC Press, United States.
2. Hari D. Sharma and Krishna R. Reddy, "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies", John Wiley and Sons, Inc., United States.
3. G.S. Birdie and J. S. Birdie, Water Supply and Sanitary Engineering, 8th Edition, Dhanpat Rai and Sons Publishers, New Delhi, 2010
4. H.S. Peavy and D.R.Rowe, Environmental Engineering, 1st Edition, McGrawHill Publishing Company, New York, 1984.

Reference Books:

1. David E. Daniel, "Geotechnical Practice for Waste Disposal", Chapman & Hall, Springer Publishers, Germany.
2. Rowe R. Kerry, "Geotechnical and Geoenvironmental Engineering Handbook", Springer Publishers, Germany.
3. Proceedings of the International symposium of Environmental Geotechnology (Vol. I and II), Environmental Publishing Company, 1986 and 1989.
4. ASTM Special Technical Publication 874, Hydraulic Barrier in Soil and Rock, 1985.

<table>
<tr><td>Course Title</td><td colspan="5">Environmental Impact Assessment</td><td colspan="3">B.Tech CE VII Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE109</td><td rowspan="2">Open Elective
(OEC III)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
Deals with the various impacts of infrastructure projects on the components of environment and method of assessing the impact and mitigating the same.
The student is able to know about the various impacts of development projects on environment and the mitigating measures.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Perform a critical quality review of an EIA and EIS.</td></tr>
<tr><td>CO 2</td><td colspan="8">Structure the EIA working process considering the need for interdisciplinary.</td></tr>
<tr><td>CO 3</td><td colspan="8">Perform the screening and scoping of an EIA, based on existing
Requirements, evaluate the impacts and draw meaningful conclusions from the results of the EIA.</td></tr>
<tr><td>CO 4</td><td colspan="8">Clarify the concept of EIA and its application in an international context to those involved in or affected by the EIA process.</td></tr>
<tr><td>CO 5</td><td colspan="8">Interpretation an EIA, present its conclusions and translate its conclusions into actions.</td></tr>
</table>

UNIT – I

Basic Concepts of EIA

Introduction -Initial Environmental Examination – Elements of EIA – Factors Affecting E-I-A – Impact Evaluation and Analysis – Preparation of Environmental Base Map – Classification of Environmental Parameters.

UNIT – II

EIA Methodologies

Introduction – Criteria for the Selection of EIA Methodology – E I A Methods – Ad-Hoc Methods – Matrix Methods – Network Method – Environmental Media Quality Index Method – Overlay Methods and Cost/Benefit Analysis.

UNIT – III

Environmental Management Plan

EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT – IV

Assessment of Impact on Vegetation and Wildlife

Introduction – Assessment of Impact of Development Activities on Vegetation and Wildlife.

Environmental Audit

Introduction - Environmental Audit & Environmental Legislation – Objectives of Environmental Audit – Types of Environmental Audit – Audit Protocol – Stages of Environmental Audit – Evaluation of Audit Data and Preparation of Audit Report.

UNIT – V

Environmental Acts (Protection and Prevention)

Post Audit Activities-The Air, water, Wild Life and Environmental Protection (Prevention Control Acts).

Case Studies

Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Highway project, Sewage treatment plant,

Text Books:

1. Y Anjaneyulu and Valli Manickam "Environmental Impact Assessment Methodologies", B S Publications, Sultan Bazar, Hyderabad.
2. J Glynn Henry and Gary W Heinke "Environmental Science and Engineering", Prentice-Hall of India (P) Limited, New Delhi.

Reference Books:

1. Dr. Suresh K Dhameja "Environmental Science and Engineering", S K Kataria & Sons Publishers, New Delhi.
2. H S Bhatia "Textbook on Environmental Pollution and Control", Galgotia Publications Pvt. Limited, New Delhi.
3. Rau and Wooten "Environmental Impact Analysis Handbook", Tata McGraw-Hill Companies, Inc. New York.

<table>
<tr><td>Course Title</td><td colspan="4">Intelligent Control Techniques</td><td colspan="3">B. Tech. EEE
Open Elective - III</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE205</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn neural network and fuzzy logic concepts and foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand architecture and approach to Artificial intelligence</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms and their models</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic systems</td></tr>
<tr><td>CO 4</td><td colspan="8">Understand the Bio-inspired and Swarm Intelligence Algorithms</td></tr>
</table>

UNIT - I

Introduction to Artificial Intelligence: Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System –Rule based Systems – Knowledge Representation.

UNIT - II

Artificial Neural Networks: Basics of ANN - Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules.

UNIT - III

ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories Neural Networks as Associative Memories

UNIT - IV

Fuzzy Logic: Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT - V

Evolutionary Computation - Overview of other Bio-inspired Algorithms - Swarm Intelligence Algorithms

Text Books

1. Introduction to Neural Networks using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Tata McGraw Hill Edition, 2006.

2. Kumar S., “Neural Networks - A Classroom Approach”, Tata McGraw Hill, 2004.
3. Fuzzy Logic with Engineering Applications by Timothy J. Ross, WILEY India Edition, 3rd Edition, 2012.

Reference Books

1. Intelligent System – Modeling, Optimization & Control by Yung C. Shin and Chengying Xu, CRC Press, 2009.
2. Eiben A. E. and Smith J. E., “Introduction to Evolutionary Computing”, Second Edition, Springer, Natural Computing Series, 2007.
3. Engelbrecht A. P., “Fundamentals of Computational Swarm Intelligence”, John Wiley & Sons, 2006.

<table>
<tr><td>Course Title</td><td colspan="5">Electrical System Estimation & Costing</td><td colspan="3">B. Tech. EEE
Open Elective - III</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE206</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn about estimating and costing of wiring systems, earthing systems, various light schemes and its calculations.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand principles of wiring systems and its estimation based on choice of wiring system</td></tr>
<tr><td>CO 2</td><td colspan="8">Understand the concepts of earthing systems</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand various lightening schemes and its calculations used for domestic and industrial applications</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze estimation of wiring to residential & commercial buildings</td></tr>
</table>

UNIT-I

General principles of estimating: Estimating – purpose of estimating and costing – catalogues – market survey and source selection - determination of required quantity of materials – determination of cost material and labor.

Wiring systems: Introduction – Systems of distribution of electrical energy – methods of wiring – systems of wiring – choice of wiring systems.

UNIT – II

Earthing Systems: Earthing – Points to be earthed – Factors influencing earth resistance – methods od reducing Earth resistance – Design data on earth electrodes – Methods of earthing – determination of size of earth wire and earth plate – Effects of electric current on Human body – Measurement of earth resistance.

UNIT - III

Lighting schemes and calculations: Types of lighting circuits – Various circuit diagrams – Two way switching – Aspects of good lighting service – Types of lighting schemes – Filament Lamps- Gas filled Lamps – Fluorescent Tubes - LED lamp – Compact Fluorescent lamp (CFL) – comparison between LED and CFL – terms used in illumination – laws of illumination.

UNIT - IV

Estimation of lighting schemes: Design of lighting schemes - Factory lighting – Public lighting installations: Classification – General principles – Design – Selection of equipment - Street lighting – Methods of lighting calculations.

UNIT-V

Internal wiring estimation: General rules for wiring – determination of number of points – determination of total load – determination of sub circuits – determination of ratings of main switch and distribution board – determination of size of conductor – layout – simple problems.

Text books

1. Electrical installation estimating & Costing – J.B.Gupta, S.K.Kataria& sons.
2. Electrical design estimating and costing – K.B.Raina&S.K.Bhattacharya, NewAge International (P) Limited publishers.

Reference Books

1. Power System Analysis and Design – Dr.B.R.Gupta, S.Chand Publications
2. Electrical Estimating methods – Wayne J.Del Pico, Wiley Publishers

<table>
<tr><td>Course Title</td><td colspan="5">Entrepreneurship</td><td colspan="3">B.Tech ME VII Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE311</td><td rowspan="2">OEC- III</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>--</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Understand the concepts of entrepreneurship, its need and scope Understand meaning of term entrepreneur, classification of entrepreneur and qualities of an entrepreneur.
- Concept and procedure of idea generation
- Elements of business plan and its procedure
- Project management and its techniques
- 5Behavioral issues and Time management

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify opportunities and deciding nature of industry.
CO 2	Know the importance of Women entrepreneurship, Brainstorm ideas for new and innovative products or services.
CO 3	Identify the importance of MSME and know the preparation of Business plan.
CO 4	Use project management techniques like PERT and CPM.
CO 5	Analyze behavioral aspects and use time management matrix.

UNIT-I

Entrepreneur and Entrepreneurship: Concept of Entrepreneur, Characteristics of entrepreneur, Functions of an Entrepreneur, Types of entrepreneur, Concept of Entrepreneurship, Types of Entrepreneurship, Enterprise, Types of Enterprise, Entrepreneurial Myths, Challenges and Opportunities in Entrepreneurship in India, Role of Entrepreneurship in Economic Development,

UNIT-II

Women Entrepreneurship and Choice of Technology: Concept of Women Entrepreneur ,Problems of Women Entrepreneur ,Growth of women entrepreneurship in India, Evaluation of ideas and their sources, Selection of Technology, Collaborative interaction for Technology development, Social Responsibility and Business Ethics.

UNIT-III

MSMEs& New Venture Creation: Concept of MSME, Role & Importance of MSMEs, Growth & development of MSMEs in India, Current schemes for MSMEs, Business opportunities in India, Elements of Business Plan and its salient features presenting a business plan.

UNIT-IV

Project Management: During construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management, Assessment of tax burden.

UNIT-V

Entrepreneurial Behaviours and Motivation: Introduction, Entrepreneurial Input, And Entrepreneurial Motivation: Concept and Need, Theories of Motivation, Motives for Entrepreneur

Time Management: Approaches of time management, their strengths and weaknesses. Time management matrix and the urgency addiction

Text Books:

1. Elias G. Carayannis,Elpida T. Samara "Innovation and Entrepreneurship", Springer
2.Vasant Desai, "Dynamics of Entrepreneurial Development and Management", Himalaya Publishing House, 3. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Pvt. Ltd., New Delhi
4. Prasanna Chandra, "Project-Planning, Analysis, Selection, Implementation and Review", Tata Mcgraw-Hill Publishing Company Ltd.

Reference Books:

1. Robert D. Hisrich, Michael P. Peters, "Entrepreneurship", 5/e, Tata Me Graw Hill Publishing Company Ltd., 2015.
2. Stephen R. Covey and A. Roger Merrill, "First Things First", Simon and Schuster Publication.
3. Sudha G.S., "Organizational Behavior", National Publishing House, 1996.

<table>
<tr><td>Course Title</td><td colspan="4">Solar Energy Systems</td><td colspan="3">B.Tech ME VII Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE312</td><td rowspan="2">OEC- III</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Familiarize with basics of solar radiation, available solar energy and its measurement.
- Familiarize with solar collectors, construction and operation of solar collectors.
- Understand solar energy conversion systems, applications and power generation.
- Learn the principles PV technology and techniques of various solar cells/ materials for energy conversion
- Know the advance current technology of the solar energy systems for making the process economical, environmentally safe and sustainable.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Gain Knowledge On Basic Concepts Of Solar Radiation And Solar Collectors.
CO 2	Illustrate Design And Operation Of Solar Heating And Cooling Systems.
CO 3	Discuss The Principles Of Solar Thermo Photovoltaic cells
CO 4	Analyze The Performance Of A Solar Cell Array System.
CO 5	Explain Passive Heating Concepts And Passive Cooling Concepts.

UNIT – I

Solar radiation and collectors

Solar angles – Sun path diagrams – Radiation - extra terrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT-II

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.

UNIT – III

Solar PV fundamentals

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells – Solar thermo-photovoltaic cells.

UNIT - IV

SPV system design and applications

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT - V

Solar passive architecture

Thermal comfort - bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - Radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – Energy efficient landscape design - thermal comfort.

Text Books:

1Goswami D.Y., Kreider, J. F. and Francis., "Principles of Solar Engineering', Taylor and Francis, 2000.
2.Chetan Singh Solanki, "Solar Photovoltatics – Fundamentals, Technologies and Applications", PHI Learning Private limited,
2011.

Reference Books:

1. Sukhatme S.P.,. Nayak.J.P, 'Solar Energy – Principle of Thermal Storage and collection", Tata McGraw Hill, 2008.
2. Solar Energy International, "Photovoltaic – Design and Installation Manual" – New Society Publishers, 2006.
3. Roger Messenger and Jerry Vnetre, "Photovoltaic Systems Engineering", CRC Press, 2010.

Course Title	**Internal Combustion Engine**					**B.Tech ME VII Sem**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE313	**OEC- III**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- This course provides techniques of applying management principles to professional positions held by Engineers and Engineering Technologists
- The management functions, especially suited to scientist & Professionals in technical and industrial environment are part of the curriculum
- Students are exposed to the theory and practices of modern management approaches, tools and techniques in complex industrial & Competitive economic environment

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use knowledge and comprehension in management tools to apply in technical organizations.
CO 2	Understand and build their analytical abilities in the use of Industrial Management
CO 3	Use management techniques to direct the organizations/industries for goal achievement
CO 4	Solve problems associated with the operations management and scheduling of resources in efficiently and effectively.
CO 5	The students may be asked use knowledge of management techniques and write a computer program to address and solve more complicated problems and to study the effect of various parameters on the management/organization

UNIT – I

Power Cycles:

Carnot cycle, Air standard cycles -Description and representation of Otto cycle, Diesel cycle & Dual cycles on P–V and T-S diagram -Thermal Efficiency – Comparison of Otto, Diesel and Dual cycles. Simple problems on Otto, Diesel and Dual cycles

UNIT-II

I.C. Engines:

Energy conversion – basic engine components –Classification of I.C. Engines, Working principle of two stroke and four stroke engines - comparison of two stoke and four stroke, SI and CI engines –Valve and port timing diagrams, application of I.C Engines.

UNIT – III

Engine Systems:

Working principle of, Magneto & Battery Ignition System **-** Simple Carburetor - Common rail fuel Injection System - Air & Thermostat cooling system - Petrol & Pressure Lubrication system.

UNIT - IV

Combustion in S.I. Engines:

Homogeneous Mixture - Stages of combustion - Importance of flame speed and factors influencing the flame speed –Abnormal Combustion - Phenomenon of Knocking, Summary of Enginevariables affecting the knocking, pre-ignition.

UNIT - V

Testing and Performance:

Engine Performance Parameters - Determination of brake power, friction power and indicated power – Performance test – Heat balance sheet and chart- Emissions from Diesel & Petrol Engines, Euro Norms - Simple problems on performance and heat balance sheet.

Text Books:

1. I.C. Engines, V. GANESAN- TMH.
2. I.C. Engines / Heywood /McGraw Hill.

Reference Books:

1. Thermal Engineering / R.K Rajput / Lakshmi Publications.
2. I.C Engines – Mathur& Sharma – DhanpathRai& Sons.
3. Engineering fundamentals of I.C Engines – Pulkrabek / Pearson /PHI
4. Thermal Engineering / Rudramoorthy – TMH

<table>
<tr><td>Course Title</td><td colspan="4">Electronic Instrumentation and measurements</td><td colspan="4">Open Electives</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE405</td><td rowspan="2">OE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To study Performance characteristics of Instruments.
- To understand the principles in Analog and Digital Instruments.
- To understand the working of CROs, Transducers and bridges.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the performance characteristics of an instrument.
CO 2	**Understand** the principle of analog, digital voltmeters and wave analyzers
CO 3	**Explain** different types of oscilloscopes
CO 4	**Use** AC and DC bridges for relevant parameter measurement.
CO 5	**Apply** the complete knowledge of various electronic transducers to measure the physical Quantities in the field of science and technology

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 and Dynamic error.
Analog Instruments: Transistor Voltmeter, Micro Voltmeter (Chopper type) – DC Differential voltmeter – AC voltmeters – Multi meter -wave analyzers (AF & RF) – Harmonic distortion analyzer- Spectrum analyzer.

UNIT II

Digital Instruments: Digital Voltmeters (Ramp, Dual slope, stair case, successive approximation types) Digital multi meter, Universal counter, Digital tachometer, Digital Phase meter.

UNIT III

Cathode Ray Oscilloscopes: Motion of electron in electronic field and in magnetic field- Block diagram of CRO, CRT, Electrostatic deflection sensitivity – Vertical and Horizontal deflection systems – Principle of operation of dual beam, dual trace, sampling and storage CRO's- Measurements with CRO (Voltage, Current, time, frequency, Phase angle, lissajous figures).

UNIT IV

Bridges: Wheat stone bridge, Kelvin Bridge, Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance-Schearing Bridge, Wien Bridge Errors and precautions in using bridges- Q meter and measurement methods.

UNIT V

Transducers: Active & passive transducers**,** Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement. Data acquisition systems.

Text Books:

1. H.S. Kalsi," Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
2. A.D. Helfrick and W.D. Cooper,"Modern Electronic Instrumentation and Measurement Techniques",PHI, 5th Edition, 2002.

References:

1. David A. Bell, "Electronic Instrumentation & Measurements", PHI (OUP), 2nd Edition, 2003.
2. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed., 2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", by Pearson Education – 2005.

<table>
<tr><td>Course Title</td><td colspan="4">Introduction to IOT</td><td colspan="3">Open Electives</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE406</td><td rowspan="2">OE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To understand the basics of IOT.
To study the Programming Using Arduino.
To provide the knowledge about sensors and transducers.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand about IoT, its Architecture and its Applications, basic electronics used in IoT & its role.</td></tr>
<tr><td>CO 2</td><td colspan="8">Develop applications with C using Arduino IDE.</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze about sensors and actuators.</td></tr>
<tr><td>CO 4</td><td colspan="8">Design IoT in real time applications using today’s internet & wireless technologies.</td></tr>
</table>

Unit I
INTRODUCTION: Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications Applications of IoT – Industrial IoT – Security in IoT.

Unit II
BASIC ELECTRONICS FOR IoT: Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

Unit III
PROGRAMMING USING ARDUINO: Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

Unit IV
SENSORS AND ACTUATORS: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.

Unit V
SENSOR DATA IN INTERNET: Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).

Text Books

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-On Approach”, 2014. ISBN: 978-0996025515.
2. Boris Adryan, Dominik Obermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017.

Reference Books

1. Michael Margolis, “Arduino Cookbook”, O‟Reilly, 2011.
2. Marco Schwartz, “Internet of Things with ESP8266”, Packt Publishing, 2016.
3. Dhivya Bala, “ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”, 2018.

Course Title	Nano Electronics					Open Electives		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE407	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90 Min					End Exam Duration: 3Hrs			
Course Objectives: To understand the principles of tunneling, lithography and scaling of physical systems. To provide the knowledge about MEMS and NEMS.								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understand the divers electronic and device fabrication.							
CO 2	Demonstrate the applications of FET and MOSFET							
CO 3	Describe lithography.							
CO 4	Analyze MEMS and NEMS							

Unit-I

Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal—Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Tunnel Junctions, Tunnel Junction Excited by a Current Source. Spintronics and Foundations of nano-photonics.

Unit-II

Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode.

Unit-III

Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, overlay-accuracies, Mask-Error enhancement factor (MEEF), Positive and negative photoresists, Electron Lithography, Projection Printing, Direct writing, Electron resists. Lithography based on Surface Instabilities: Wetting, De-wetting, Adhesion, Limitations, Resolution and Achievable / line widths etc. Lift off process, Bulk Micro machining.

Unit-IV

Introduction to MEMS and NEMS, working principles, as micro sensors (acoustic wave sensor, biomedical and biosensor, chemical sensor, optical sensor, capacitive sensor, pressure sensor and thermal sensor), micro actuation (thermal actuation, piezoelectric actuation and electrostatic actuation–micro gripers, motors, valves, pumps, accelerometers, fluidics and capillary electrophoresis, active and passive micro fluidic devices, Piezoresistivity, Piezoelectricity and thermoelectricity, MEMS/NEMS design, processing, Oxidation, Sputter deposition, Evaporation, Chemical vapor deposition etc.

Unit-V

Introduction – Scaling of physical systems – Geometric scaling & Electrical system scaling. The Single-Electron Transistor: The Single- Electron Transistor Single-Electron Transistor Logic, Other SET and FET Structures, Carbon Nanotube Transistors (FETs and SETs), Semiconductor Nanowire FETs and SETs,Coulomb Blockade in a Nanocapacitor, Molecular

SETs and Molecular Electronics.

Text Book:

1. Stephen D. Sentaria, *Microsystem Design, Kluwer Academic Press*
2. Marc Madou, *Fundamentals of microfabrication & Nanofabrication.*
3. T. Fukada & W.Mens*, Micro Mechanical system Principle & Technology, Elsevier, 1998.*
4. Julian W.Gardnes, Vijay K. Varda, *Micro sensors MEMS & Smart Devices, 2001*.

Reference Books:

1. WR Fahrner, “Nano Terchnology and Nano Electronics – Materials, devices and measurement Techniques”, Springer.
2. T.Pradeep, “Nano: The Essentials – Understanding Nano Scinece and Nanotechnology”, Tata Mc.Graw Hill.
3. M. Ziese and M.J. Thornton, “Spin Electronics”
4. Karl Goser, Peter Glosekotter, Jan Dienstuhl, “Nanoelectronics and Nanosystems – From Transistor to Molecular and Quantum Devices”.

Course Title	CYBER SECURITY (Open Elective Course – III)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
20OE3905	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**EndExam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To learn about cybercrimes and how they are planned
- To learn the vulnerabilities of mobile and wireless devices
- The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understanding the basic cyber security concepts
CO 2	Classifying the international laws and cyber forensics
CO 3	Remembering to cyber-crime.
CO 4	Recognizing cybercrime and cyber terrorism.
CO 5	Understanding the privacy issues.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless ComputingEra, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains medical, financial, etc.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

4. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRCPressT&F Group.

Reference Books:

1. Cyber Security Engineering: A Practical Approach for Systems and Software Assurance, Nancy R. Meade, Carol C. Woody, Addison Wesley.

2. The Cyber Security: Self help Guide, Arun Soni, CRC Press.

3. Cyber Security: Analytics, Technology & Automation, Martti Lehto, Pekka Neittaanmaki, Springer.

4. Cyber Security: Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, SYBEX.

Course Title	JAVA PROGRAMMING (Open Elective Course – III)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
20OE3906	**OEC**	**L**	**T**	**P**	**C**	**ContinuousInternal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3 Hrs**			

Course Objectives:

- To give the students a firm foundation on Java concepts like Primitive data types, Java control flow, Methods, Object-oriented programming, Core Java classes, packages and interfaces, multithreading.
- To provide the students with an understanding of Java applets, Abstract Window, Toolkit and exception handling.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Solve problems using object oriented approach and implement them using Java
CO 2	Apply the concept of inheritance, polymorphism and Packages, Interfaces
CO 3	Implement Exception handling and able to develop multithreaded applications with synchronization.
CO 4	Able to develop applets for web applications.
CO 5	Able to design GUI based applications.

UNIT – I

Object Oriented Programming basics: Need for OOP paradigm, Principles of OOPconcepts.

Java Basics: History of Java, Java buzzwords, Simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control**, this** keyword, overloading methods and constructors.

UNIT – II

Inheritance: Inheritance basics, Types of Inheritance, benefits of inheritance, **super** uses, using **final** with inheritance, polymorphism- method overriding, abstract classes.

Packagesand Interfaces: Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT – III

Exception handling and multithreading: Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT – IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling Mouse and Keyboard events, Adapter classes, The AWT class hierarchy, user interface components- Labels, Button, Scrollbars, Text Components, Check box, Choices,

UNIT – V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an Applet, creating applets, passing parameters to applets.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell,eighth Edition, Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell,eighth Edition, Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino andF.A.Hosch, John wiley & sons.
2. An introduction to Java programming and object oriented applicationdevelopment, R.A. Johnson-Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

<table>
<tr><td>Course Title</td><td colspan="5">Transforms and Their Applications</td><td colspan="3">OPEN ELECTIVE-III</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE612</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td></td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
To enable the students to apply the knowledge of mathematics in various engineering fields by making them to learn the following:
• Laplace Transforms is used for making predictions and making analysis in data mining.
• Laplace transforms in engineering problems.
• Understand Fourier Transforms and apply them in solving problems.
• Inculcate the concept of Z-Transforms and its applications.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand Laplace Transforms in engineering problems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply Laplace Transforms in engineering problems.</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand Fourier Transforms in engineering problems.</td></tr>
<tr><td>CO 4</td><td colspan="8">Apply Fourier Transforms in engineering problems.</td></tr>
<tr><td>CO 5</td><td colspan="8">Understand concept of Z-Transforms and its applications.</td></tr>
</table>

UNIT I:

Laplace transforms of standard functions – Properties of Laplace Transforms - Transforms of derivatives and integrals- Evaluation of integrals by Laplace transforms – Unit step function – Second shifting theorem – Dirac's delta function. Laplace transforms of periodic functions.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand Laplace Transforms in engineering problems.

UNIT II:

Inverse Laplace Transforms. Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

Learning Outcomes:
At the end of this unit, the student will be able to

- Apply Laplace Transforms in engineering problems.

UNIT III:

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties of Fourier transform.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand Fourier Transforms in engineering problems.

UNIT: IV:

Inverse transforms – Convolution theorem of Fourier transform- Parseval's identity for Fourier transforms- Relation between Fourier and Laplace transforms. Fourier transforms of the derivatives of a Function. Applications of transforms of boundary value problems (Only Heat Conduction).

Learning Outcomes:
At the end of this unit, the student will be able to

- Apply Fourier Transforms in engineering problems.

UNIT V

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

Learning Outcomes:
At the end of this unit, the student will be able to

- Understand concept of Z-Transforms and its applications.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition-2013.
3. Engineering Mathematics Volume-1, Dr. D.S Chandra Sekharaiah, Prism Books Pvt. Ltd.
4. Engineering Mathematics by Srimanta Pal, Subodh C. Bhunia, Oxford University Press.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.
3. Advanced Engineering Mathematics, Greenberg Michael D, Cengage Publishers.
4. Introduction to Laplace Transforms and Fourier Series, Philip Dyke, Springer.

Course Title	**PHYSICS OF RENEWABLE ENERGY**					**OPEN ELECTIVE – 3**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**			
20OE613	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**	
		3	**0**	**0**	**3**	40	60	100	
					End Exam Duration: 3Hrs				

COURSE OBJECTIVES:

1. A top priority for developing renewable energy in India is to boost the economy, encourage the development of energy security, and reduce carbon emissions.
2. Promote sustainable development and promote economic integration.
3. Ensure that any energy sector products that come into use do so with minimal impact on the environment.
4. Take every step to ensure that energy generation, conversion, and use are cost-competitive.

COURSE OUTCOMES: Upon completion of the course, the student will be able to:

CO1	**Understand** the energy resources.
CO2	**Apply** the Solar energy.
CO3	**Idealized** wind turbine
CO4	**Underground** heat – Micro hydro plants.
CO5	**Classify** the different types of energy resources.

UNIT I: Bio diversity conception individuals

Introduction to renewable energy– Biogas cogeneration – Wood as a source of energy – Energy crops – Bio diesel – Fuel from plantation – Ethanol – Synthesis fuels.

UNIT II: Solar energy

Solar thermal: Solar collectors – Hot water from Sun – Cooling with the Sun – Solar drying – Air collectors – Solar thermal power plants.

Solar electric: Photo voltaic effect – The heart of a PV array – The solar cell – Solar energy as part of sustainable development.

UNIT III: Wind Energy

Power in the wind: Aerodynamics principles of wind turbines – Power available in the wind – Rotor efficiency – Factors affecting wind power – Impact of tower height – Wind turbines sitting – Idealized wind turbine – Power curve – Speed control for maximum power.

UNIT IV: Hydro-Energy

Introduction -Water power – Ocean wave and tidal energies – Hydro power nature conservation – Underground heat – Micro hydro plants.

UNIT V: Geothermal Energy

Introduction-Geothermal Resource -Mining Thermal Energy From a Hot Dry Rock-Geothermal Heat Pumps-Active Volcanoes, Plate Tectonics, and the “Ring of Fire”.

Text books:

1. Hand book of renewable energy technology -A.F.Zobba and R.Bansal, World scientific publications.
2. Renewable energy: The facts - Dieter Scirfried and Walter Witzel. Earth scan publications for sustainable future.

Reference books:

3. http://www.law.du.edu/index.php/the-renewable-energy-reader/6-geothermal

Course Title	Fuel Technology					B. Tech. (Open elective-III)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE614	**Open Elective**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Min					**End Exam Duration: 3Hrs**			

Course Objectives:

- The students will have the general knowledge of Fuels in the context of clean power, sustainability and alternative fuels
- To build up knowledge of concepts and theories of fuel combustion & control process

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Recall** the Characteristics & properties of a fuel.
CO 2	**Analyze** the concepts of solid fuels and evaluate the calorific value of solid fuels by Bomb Calorimeter.
CO 3	**Explore** the synthesis of synthetic petrol & process of Refining of petroleum.
CO 4	**Identify** various gaseous fuels and explain their preparation and properties.
CO 5	**Discuss** about the purpose of different alternative fuels, merits & demerits of alternative fuels

UNIT-I-Introduction

Fuels-Introduction, Classification of Fuels, Differences between Solid, Liquid & gaseous fuels. Characteristics of a Good fuel, Calorific Value of Fuels-Gross calorific value(GCV) & Net calorific Value (NCV)- definition, units & their relation, Numerical problems on calorific value.

Learning Outcomes:

At the end of the unit, The students will be able to

- Classification of fuels
- Analyze the characteristics of a good fuel

UNIT-2-Solid Fuels

Introduction, Types of Coal, Coal formation, Properties, Advantage & disadvantages of solid fuels. Proximate & Ultimate analysis of coal. Manufacture of metallurgical Coke-Otto Hoffmann method, Determination of Calorific value of solid fuel by Bomb calorimeter,

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain the advantages and disadvantages of solid fuel
- Determine the calorific value of fuel by Bomb Calorimeter

UNIT-3-Liquid Fuels

Introduction, Properties, Advantages & disadvantages of Liquid fuels, Classification of petroleum, refining of petroleum-Fractional distillation of crude oil, uses of various petroleum products, Synthetic Petrol- methods-Fischer-Tropsch method and Bergius process. Knocking-Octane number, Cetane Number-Definitions

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain the advantages and disadvantages of Liquid fuel.
- Discuss about refining of petroleum and uses of various petroleum products.

UNIT-4-Gaseous Fuels

Introduction, Properties, Advantages & disadvantages Of Gaseous fuels - Preparation, properties & uses of Natural gas, producer gas, water gas, Propane. Determination of calorific value of gaseous fuels by Junker's Gas Calorimeter-Principle & applications.

Learning Outcomes:

At the end of the unit, The students will be able to

- Explain the advantages and disadvantages of Gaseous fuel.
- Preparation and properties of different types of gaseous fuels

Unit-5-Need for Alternate Fuels

Need for alternate fuels- Effects of Exhaust gas emissions on environment & Humans (NO, NO_2, CO_2, CO, SO_X). Introduction to alternate fuels- General uses of alternate fuels like Hydrogen, LPG, CNG, Biogas, Methanol, Ethanol, Butanol. Biofuels-Types of Biofuels, Applications of Biofuels, Merits & demerits of alternate fuels.

Learning Outcomes:

At the end of the unit, The students will be able to

- Know about the effects of exhaust gas emissions on environment and humans.
- Analyze the merits and demerits of alternate fuels

<u>Textbooks:</u>

1. Text Book of Engineering Chemistry, Shashi Chawla, Dhanapath Rai Publications, New Delhi, 4th Edition, 2011.
2. Internal Combustion Engine Fundamentals, Heywood John B, Pragnya IAS Publications
3. General Chemistry for Engineers, Jeffrey S. Gaffrey & Nancy A. Marky
4. Fuels & Fuel- Additives, S.P.Srivastava , Jeno Hancsok, Willey Publications

REFERENCES:

1.A Text Book of Engineering Chemistry, Jain and Jain, Dhanapath Rai Publishing Company, New Delhi, 15th Edition, 2010.

2. Alternative Liquid fuels, Desai Ashok V, Willey Publications

3. Introduction to Combustion, Turns Stephen R, Mc GrawHill Publications

4. Fuels and Fuels Technology, Wilfrid Francis, Martin C. Peters, 2^{nd} edition, Elsevier publications

Course Title	PROFESSIONAL COMMUNICATION				OPEN ELECTIVE – III		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20OE615	HUM	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90 Min					End Exam Duration: 3Hours			

Objectives:

- To help the students get on in their professions and get success professionally.
- To help the students learn communication techniques.
- To make the students thorough with presentation skills to become effective participants in various discussions.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	The students will be able to understand the processes of communication and apply communication techniques for effective communication.
CO 2	The students will be able to improve group behaviour and participate effectively in the team work thereby improving professional prospects.
CO 3	The students will be able to present effectively orally and in writing

Syllabus

Unit :1

1. **Professional Communication**

Role of Professional Communication- Professional Communication Skills- Tips to improve professional communication skills.

Unit 2

Technical Communication

Significance of technical communication- Use of vocabulary in formal letters / reports and e-mails.- Compound words , misspelled words, using of similar words to express the idea, analogies. Grammar: Subject - Verb agreement, Active and Passive voice, Embedded sentences, clauses and conditionals.

Unit 3

Reading Comprehension

Comprehension - Reading comprehension techniques-Styles, speed and evaluation of Reading - critical reading- Paraphrasing / summarizing: SQ3R method, PQRST method

Unit 4

Oral Presentation

Oral Presentation techniques- Public speaking - guidelines for presentation- tone and voice modulation- Use of visuals in presentation- Group Discussion - strategies

Unit 5

Writing Skills

Writing - formal and informal writing - formal and informal letters - formal and informal reports- Common errors in writing, elements of styles- Analytical and issued based essays.

Reference Books

1. Ashraf Rizvi, "Effective Technical Communication", 2nd Edition, McGraw Hill Education, 2017.

2. Raman Sharma, “Technical Communications”, Oxford Publication, London, 2004.

3. Meenakshi Raman and Sangeetha Sharma, “Technical Communication: Principles Practice”, 2nd Edition, Oxford University Press, 2011

4. English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Black swan 2010.

5. Stephen E. Lucas, "The Art of Public Speaking", 10th Edition; McGraw Hill Education, 2012.

6. William Strunk Jr. & E.B. White, "The Elements of Style", 4th Edition, Pearson, 1999.

7. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.

8. Goodheart-Willcox, "Professional Communication", First Edition , 2017.

9. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 edition,2015.

10. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1edition, 2013.

<table>
<tr><td>Course Title</td><td colspan="4">Digital & Social Media Management</td><td colspan="3">B. Tech.
Open Elective - III</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE616</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 90 Min</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
</table>

Course Objectives: The objective of the course is

- Review key trends within the Digital Marketing landscape. Examine an example of each Digital Marketing channel.
- Examine SEO's Position as a Fundamental Building Block for Online Marketing
- Identify and appropriately apply Fundamental Factors That Result in Achieving Top Search Engine Rankings.
- Develop an email and sending strategy that adheres to email compliance best practices. Analyze the role that social marketing plays in the digital landscape and marketing mix.
- Identify and incorporate individual social and mobile platforms into a digital marketing strategy. Utilize Google Analytics to examine the role that web analytics play in digital marketing

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Explain the role and importance of digital marketing, Ability to comprehend how digital media can be used for current marketing practices.
CO 2	Understanding of Search Engine optimization, Pay per click and Email marketing,
CO 3	Analyze the role that social media marketing plays in the digital landscape and marketing mix.
CO 4	Identify and incorporate individual social and mobile media platforms into a digital marketing strategy.
CO 5	Understanding of content creation, content marketing channels, writing messages and content marketing plan, Utilize Google Analytics to examine the role that web analytics play in digital marketing.

Unit I

Introduction to Digital Marketing: Introduction to marketing in the digital environment, Online marketplace analysis: micro-environment - The Internet macro-environment, What Are the 3i Principles?

Unit II

Digital Marketing Strategy: Content Marketing - Online Offer - Online Space / website Selling - Online Value - Internet for Distribution.
Search Engine Marketing: Search Engine Optimization, Pay Per Click, Digital Display Advertising, Introduction to page rankings, Email Marketing.

Unit III

Social Media Marketing: Social Media, Social Media Mining, Content guidelines for online communications, Social Media Channels and Social Media Strategy. Cyber crime and security.

Unit IV

Mobile Marketing: Mobile Marketing Fundamentals, Mobile consumers, Digital consumption, M-commerce, Technological change and marketing, Overview of mobile and app based marketing, Mobile websites, Conducting Mobile Audits, Strategic objectives.

Unit V

Facebook for Business: Facebook for Business-Facebook fan Engagement, Anatomy of Ad Campaign, Adverts Types of adverts, Adverts Targeting. Case Study-Tata DoCoMo

Text Books

1. Digital Marketing: by Raghavendra K & ShrutiPrabhakar, HPH

References

1. e Marketing: The Essential Guide to Digital Marketing: by Rob Stokes (2010), Quirk Education.
2. The Art of Digital Marketing: by Ian Dodson, Wiley.
3. Social Media Marketing: Strategies for Engaging in Facebook, Twitter & Other Social Media: by Liana Evans, Que Publishing
4. E-Marketing: by Strauss, J. and Frost, R., Pearson Education, Inc

<table>
<tr><td>Course Title</td><td colspan="5">Industrial Safety Engineering</td><td colspan="3">B.Tech CE VII Sem (R20)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE110</td><td rowspan="2">Open Elective (OEC-IV)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
</table>

Course Objectives:
The course is intended to give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context. Learners will be able to compare different hazard identification tools and choose the most appropriate based on the nature of industry

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the theories of accident causation and preventive measures of industrial accidents
CO 2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
CO 3	Explain different safety issues in construction industries.
CO 4	Describe various hazards associated with different machines and mechanical material handling.
CO 5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

UNIT – I
Safety Introduction
Need for safety. Safety and productivity. Definitions: Accident, Injury, Unsafe act, Unsafe Condition, Dangerous Occurrence, Reportable accidents. Theories of accident causation. Safety organization- objectives, types, functions, Role of management, supervisors, workmen, unions, government and voluntary agencies in safety. Safety policy. Safety Officer-responsibilities, authority. Safety committee-need, types, advantages.

UNIT – II
Personal Protection in Work Environment
Personal protection in the work environment, Types of PPEs, Personal protective equipment respiratory and non-respiratory equipment. Standards related to PPEs. Monitoring Safety Performance: Frequency rate, severity rate, incidence rate, activity rate. Housekeeping: Responsibility of management and employees. Advantages of good housekeeping. Work permit system- objectives, hot work and cold work permits. Typical industrial models and methodology. Entry into confined spaces.

UNIT – III
Safety Issues in Construction
Introduction to construction industry and safety issues in construction Safety in various construction operations – Excavation and filling – Under-water works – Under-pinning & Shoring – Ladders & Scaffolds – Tunneling – Blasting – Demolition – Confined space – Temporary Structures. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety. Relevance of ergonomics in construction safety. Ergonomics Hazards - Musculoskeletal Disorders and Cumulative Trauma Disorders.

UNIT – IV

Safety Hazards in Machines

Machinery safeguard-Point-of-Operation, Principle of machine guarding -types of guards and devices. Safety in turning, and grinding. Welding and Cutting-Safety Precautions of Gas welding and Arc Welding. Material Handling-Classification-safety consideration- manual and mechanical handling. Handling assessments and techniques- lifting, carrying, pulling, pushing, palletizing and stocking. Material Handling equipment-operation & maintenance. Maintenance of common elements-wire rope, chains slings, hooks, clamps. Hearing Conservation Program in Production industries.

UNIT – V

Hazard and Risk

Types of hazards –Classification of Fire, Types of Fire extinguishers, fire explosion and toxic gas release, Structure of hazard identification and risk assessment.

Text Books:

1. R.K Jain (2000) Industrial Safety, Health and Environment management systems, Khanna Publications.
2. Paul S V (2000), Safety management System and Documentation training Programme handbook, CBS Publication.
3. Krishnan, N.V. (1997). Safety management in Industry. Jaico Publishing House, New Delhi.
4. John V. Grimaldi and Rollin H.Simonds. (1989) Safety management. All IndiaTraveller Book Seller, Delhi.

Reference Books:

1. Ronald P. Blake. (1973). Industrial safety. Prentice Hall, NewDelhi.
2. Alan Waring. (1996). Safety management system. Chapman & Hall, England.
3. Vaid, K.N., (1988). Construction safety management. National Institute of Construction Management and Research, Mumbai.
4. AIChE/CCPS. (1992). Guidelines for Hazard Evaluation Procedures. (second edition). Centre for Chemical Process Safety, American Institute of Chemical Engineers, New York.

<table>
<tr><th>Course Title</th><th colspan="5">Surveying</th><th colspan="3">B.Tech CE VII Sem (R20)</th></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">20OE111</td><td rowspan="2">Open Elective (OEC IV)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td></td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
</table>

Course Objectives:

Be familiar with Chain and Compass in measuring the horizontal and verticaldistances, calculating simple areas, and correcting different errors.

Identify the level instruments; record the levels in field book and determine thereduced levels of objects by different methods.

Determine the areas and volumes on the field by different rules and methods.

Using totalstation instrument for measuring the distances, angles, and areas.

Understand the concepts of photogrammetry and remote sensing which can be used in higher surveying.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Compute linear and areal measurements by using chain and compass.
CO 2	Gain the knowledge on levelling and contouring techniques and its applications.
CO 3	Apply the modern surveying techniques for various field problems
CO 4	Know the uses of total station instrument for different field applications
CO 5	Know the concepts of Phostogrammetry and Remote sensing

UNIT-I

Introduction to Surveying: Definition; Classification; Principles of surveying; Errors in surveying: Types of errors; Ranging, Principles of chain surveying; Basic definitions.
Compass Surveying: Prismatic compass, Surveyor's compass, Whole Circle and Quadrant Bearing, Included angles, and errors.

UNIT – II

Levelling: Different methods of levelling, Different types of level instruments, Levelling staff, Level field book, Reciprocal Levelling, Evaluation of Reduced Levels byRise and Fall Method, and Height of Instrument Method
Areas: Introduction; Simpson's rule; Boundaries with offsets at irregular intervals; coordinate method; level section; two level section; trapezoidal and prismoid rule.

UNIT – III

Modern Field Survey Systems: Principle of Electronic Distance measurement; types of EDM instruments, total station, parts, accessories – advantages and applications, field procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments.

UNIT – IV

PHOTOGRAMMETRIC SURVEYING: Introduction, Basic concepts, perspective geometry of aerial photograph, relief, and tilt displacements, and terrestrial photogrammetric

UNIT – V

REMOTE SENSING: Definition, Energy Principles, radiation principles, principles, and Use of EMR spectrum, Energy interactions in atmosphere- Scattering, Absorption, Energy interactions with h surface features and concepts of spectral reflectance curve.

Text Books:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Surveying – Vol. I, II and III, Laxmi Publications (P) Ltd., 17th Edition, 2016.
2. R. Subramanian, Surveying and Levelling, Oxford University Press, 2nd Edition, 2012.
3. Chandra, A.M, Plane Surveying, 2nd Edition, New Age International Publishers, NewDelhi, 2010.
4. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi.

Reference Books:

1. S. K. Duggal, Surveying – Vol. I and II, Tata McGraw–Hill Publishing Co. Ltd., 4th Edition,2013.
2. Arthur R. Benton and Philip J. Taetz, Elements of Plane Surveying, McGraw-Hill, 3rd Edition,2010.
3. Arora, K. R., Surveying – Vol. I and II, Standard Book House, 14th Edition, 2011.
4. T. P. Kanetkar and S. V. Kulkarrni, Surveying and Levelling, Pune Vidyarthi GrihaPrakashan, Pune, 24th Edition, 2013.

<table>
<tr><th>Course Title</th><th colspan="5">Traffic Engineering</th><th colspan="3">B.Tech CE VII Sem (R20)</th></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">20OE112</td><td rowspan="2">Open Elective (OEC IV)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1.5 Hrs</td><td colspan="3">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
The objective of this course is to impart knowledge about various components and characteristics of traffic to understand concepts like Highway capacity and level of service concepts. To know various traffic control devices and principles of highway safety.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Conduct different engineering surveys required for highway planning and design</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze the traffic flow patterns and delay patterns</td></tr>
<tr><td>CO 3</td><td colspan="8">Understand the role and importance of various traffic control devices</td></tr>
<tr><td>CO 4</td><td colspan="8">Know the impact of traffic on environmental pollution and standard pollution limits</td></tr>
<tr><td>CO 5</td><td colspan="8">Understand the concepts of level of service of highways along with various highway systems required for traffic surveillance</td></tr>
</table>

UNIT – I

Components of the Traffic System

Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Accident studies.

UNIT – II

Traffic Characteristics

Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Travel time and delay studies, Car-following theories.

UNIT – III

Traffic Control Devices & Highway Safety

Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT – IV

Environmental Considerations

Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control.

UNIT – V

Highway Capacity and Level of Service

Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural

Highways, Capacity of Urban Roads;
Highway Systems: Traffic surveillance and monitoring; Intelligent vehicle highway system. IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

Text Books:

1. L R Kadiyali "Principles and Practice of Highway Engineering", Khanna Publishers, NewDelhi.
2. S K Khanna, C E G Justo and A Veeraragavan "Highway Engineering", Nemchand Publications, New Delhi.
3. Papacoastas, C. S. and Prevedouros, Transportation Engineering and Planning, ThirdEdition, Third Impression; Pearson Education, 2018.
4. Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, WileyIndia (P) Ltd., New Delhi

Reference Books:

1. G V Rao "Principles of Transportation and Highway Engineering", Tata McGraw-HillCompanies, Inc. NewYork.
2. Partha Chakroborthy, Animesh Das, "Principles of Transportation Engineering", PrenticeHall of India, New Delhi.
3. S P Bindra "Highway Engineering", Dhanpath Rai & Sons, New Delhi.
4. Traffic & Highway Engineering by Nicholas J. Garber, Lester A. Hoel, Fifth Edition, published in 2015, CENGAGE Learning, New Delhi.

<table>
<tr><td>Course Title</td><td colspan="4">Basics of Power Electronics</td><td colspan="3">B. Tech. EEE
Open Elective - IV</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE207</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn basic fundamentals of power electronics devices and to classify the different kinds of power electronics circuits as a function of the input source and loads.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">To understand the characteristics of different power switches.</td></tr>
<tr><td>CO 2</td><td colspan="8">To understand the single phase and three phase controlled rectifier with different loads</td></tr>
<tr><td>CO 3</td><td colspan="8">To understand the operating principle of cyclo converters, choppers and inverters</td></tr>
<tr><td>CO 4</td><td colspan="8">To understand harmonic content in output voltage and current waveforms of an inverter.</td></tr>
</table>

UNIT - I

Fundamentals of Power Semi-conductor devices: SCR – static characteristics –turn on and off mechanism – MOSFET, IGBT, GTO Characteristics.

UNIT - II

Phase controlled Rectifiers(AC to DC): Phase controlled rectifiers – single phase half and fully controlled converters – midpoint and bridge connections with R and RL loads – effect of source inductance- three phase half controlled converters with R load .

UNIT - III

AC Voltage Controllers (AC to AC): AC voltage controllers- single phase ac voltage controllers with SCR for R and RL load – cyclo converters – single phase cyclo converters (mid-point configuration) with R load.

UNIT - IV

Choppers (DC to DC): Choppers – principle of operation – control strategies- types of chopper circuits – type A, type B- buck -boost converter.

UNIT - V

Inverters (DC to AC): Inverters – single phase half bridge and full bridge inverters with R and RL load –output voltage control techniques - PWM techniques- harmonic reduction techniques.

Text Books

1. Power Electronics –M.D Singh & K.B. Kanchandhani, TMH publications, 1998.

2. Power Electronics - Circuits, Devices and Applications –M.H. Rashid, Prentice Hall of India, 2^{nd} Edition 1998.

Reference Books

1. Power Electronics- P.S. Bimbhra, Khanna Publications.
2. Power Electronics –Vedam Subramanyam, New Age Information Limited, 3^{rd} Edition.
3. Power Electronics –V.R. Murthy, Oxford University Press, 1^{st} Edition – 2005.
4. Power Electronics –P.C Sen, Tata Mc Graw Hill Publishing.

<table>
<tr><td>Course Title</td><td colspan="4">System Reliability Concepts</td><td colspan="3">B. Tech. EEE
Open Elective - IV</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE208</td><td rowspan="2">Open Elective (OEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6">Mid Exam Duration: 1Hr30M</td><td colspan="3">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn basic probability theory, network modeling, time dependent probability, markov modeling and system reliability evaluation.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the concept of basic probability theory, binomial distribution, network reliability, reliability functions, time dependent probability, markov chains & process and system reliability</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply probability rules to find probability distributions, network reliability for series, parallel, series-parallel, complex networks</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze the failure rate distributions, bath-tub curve, STPM, continuous markov process and frequency duration techniques for single and two repairable components</td></tr>
<tr><td>CO 4</td><td colspan="8">Evaluate transitional rates, cumulative probability and frequency n-component repairable models</td></tr>
</table>

UNIT-I

Basic Probability Theory: Basic concepts – Rules for combining Probabilities of events – Failure Density and Distribution functions – Bernoulli’s trials – Binomial distribution – Expected value and standard deviation for binomial distribution – Examples.

UNIT-II

Network Modeling and Reliability Evaluation: Basic concepts – Evaluation of network Reliability / Unreliability – Series systems, Parallel systems, Series - Parallel systems, partially redundant systems – Types of redundancies - Evaluation of network Reliability / Unreliability using conditional probability method – Paths based and Cut set based approach – Examples.

UNIT-III

Time Dependent Probability: Basic concepts – Reliability functions f(t), F(t), R(t), h(t) – Relationship between these functions – Bath tub curve – Expected value and standard deviation of Exponential distribution – Measures of reliability – MTTF, MTTR, MTBF – Evaluation of network reliability / Unreliability of simple Series, Parallel – Examples.

UNIT-IV

Discrete Markov Chains: Basic concepts – Stochastic transitional Probability matrix (STPM) – Limiting State Probability evaluation – Absorbing states.

Continuous Markov Processes: Modeling concepts – State space diagrams – time dependent reliability evaluation of single component repairable model – Evaluation of Limiting State Probabilities of one, two component repairable models – Frequency and duration concepts – Frequency balance approach.

UNIT-V

Multi Component & Approximate System Reliability Evaluation: Recursive relation for evaluation of equivalent transitional rates, cumulative probability and cumulative frequency and 'n' component repairable model - Series systems, Parallel systems, Basic reliability indices – Cut-set approach – Examples.

Text Books

1. Reliability Evaluation of Engineering Systems by Roy Billinton and Ronald N. Allan, Reprinted in India B. S. Publications, 2007.
2. System Reliability Concepts by V. Sankar, Himalaya Publishing House, 2015.

Reference Books

1. Reliability Engineering by E. Balagurusamy, Tata McGraw Hill, 2003.
2. Reliability and Maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill, 2000.

Course Title	Energy Auditing					B.Tech ME VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE314	**OEC- IV**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- Introduce the concepts of energy scenario and need for energy policy for industries in India.
- Familiarize with the Energy Audit concepts and its approaches.
- Teach the principles and objectives of the Energy management.
- Discuss the Thermal and Electrical Energy management.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Explain the fundamental aspects of energy scenario in India.
CO 2	List the various national and state level energy policy.
CO 3	Explain the concepts of energy conservation in boilers.
CO 4	Identify the thermal energy components.
CO 5	Explain the concepts of supply side methods to minimize supply.

UNIT – I

General Aspects

Review of energy scenario in India, General Philosophy and need of Energy Audit and Management, Basic elements and measurements - Mass and energy balances – Scope of energy auditing industries - Evaluation of energy conserving opportUNITies, Energy performance contracts, Fuel and Energy substitution, Need for Energy Policy for Industries, National & State level energy Policies.

UNIT-II

Energy Audit Concepts

Need of Energy audit - Types of energy audit – Energy management (audit) approach - understanding energy costs - Bench marking – Energy performance - Matching energy use to requirement - Maximizing system efficiencies -Optimizing the input energy requirements - Duties and responsibilities of energy auditors- Energy audit instruments - Procedures and Techniques.

UNIT – III

Principles and Objectives of Energy Management

Design of Energy Management Programmes - Development of energy management systems – Importance - Indian need of Energy Management - Duties of Energy Manager - Preparation and presentation of energy audit reports - Monitoring and targeting, some case study and potential energy savings.

UNIT - IV

Thermal Energy Management

Energy conservation in boilers - steam turbines and industrial heating systems - Application of FBC - Cogeneration and waste heat recovery -Thermal insulation - Heat exchangers and heat pumps –HVC industries-Building Energy Management.

UNIT - V

Electrical Energy Management

Supply side Methods to minimize supply-demand gap- Renovation and modernization of power plants - Reactive power management – HVDC- FACTS - Demand side - Conservation in motors - Pumps and fan systems – Energy efficient motors.

Text Books:

1. Murphy, W. R., Energy Management, Elsevier, 2007.
2. Smith, C. B., Energy Management Principles, Pergamum, 2007
3. Handbook of Energy Audit, Sonal Desai, Mcgraw Hill Education Private Ltd

Reference Books:

1.Turner, W. C., Doty, S. and Truner, W. C., Energy Management Hand book, 7th edition, Fairmont Press, 2009.
2. De, B. K., Energy Management audit & Conservation, 2nd Edition, Vrinda Publication, 2010.
3. Energy Management Handbook – W.C. Turner (John Wiley and Sons, A Wiley a. Interscience publication)
4. Industrial Energy Management and Utilisation –L.C. Witte, P.S. Schmidt, D.R. Brown (Hemisphere Publication, Washington, 1988)
5. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982
6. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice hall1993)

<table>
<tr><td>Course Title</td><td colspan="4">Sustainable Engineering</td><td colspan="3">B.Tech ME VII Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE315</td><td rowspan="2">OEC- IV</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To have an increased awareness among students on Issues in areas of sustainability.
- To understand the role of Engineering and technology within sustainable development
- To know the Methods ,tools and incentives for sustainable product service system development
- To Establish a clear understanding of the role and impact of various aspects of Engineering and emerging decisions on environmental, societal and economic problems

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the relevance and the concept of sustainability and the global initiatives in this Direction.
CO 2	Explain the different types of environmental pollution problems and their sustainable
CO 3	Discuss the environmental regulations and standards .
CO 4	Outline the concepts related to conventional and non-conventional energy
CO 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles.

UNIT-I

Sustainability:
Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

UNIT – II

Environmental Pollution:
Air Pollution and its effects, Water pollution and its sources, Zero
waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming,
Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

UNIT – III

Environmental management standards: ISO 14001:2015 frame work and benefits, Scope and goal of Life Cycle Analysis (LCA), Circular economy, Bio-mimicking, Environment Impact Assessment (EIA), Industrial ecology and industrial symbiosis.

UNIT – IV

Resources and its utilization: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

UNIT-V

Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy
efficiency in buildings, Green Engineering, Sustainable Urbanization, Sustainable cities, Sustainable transport

Text Books:

1.Sustainable Engineering: Drivers, Metrics, Tools, And Applications
Krishna R. Reddy, Claudio Cameselle, Jeffrey A. Adams.

2. Introduction to Sustainability for Engineers ByTulseeram, Ramjeawon

3. sustainable Engineering: Principles and Practice Hardcover – 13 June 2019 by Bhavik R. Bakshi

Reference Books:

1. Allen, D. T. and Shonnard, D. R., Sustainabilitngineering: Concepts, Design and Case Studies,PrenticeHall.

2. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development,Cengageleaming

3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006

4.Mackenthun, K. M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

5. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System

Course Title	**Industrial Engineering & Management**					**B.Tech ME VII Sem**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE316	**OEC- IV**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- This course provides techniques of applying management principles to professional positions held by Engineers and Engineering Technologists
- The management functions, especially suited to scientist & Professionals in technical and industrial environment are part of the curriculum
- Students are exposed to the theory and practices of modern management approaches, tools and techniques in complex industrial & Competitive economic environment

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concepts of Management, organization principles and also motivational qualities and leadership.
CO 2	Apply the knowledge where to and how to locate a plant, difficulties of plant layout.
CO 3	Evaluate various types of work studies processing charts and job evaluation techniques.
CO 4	Apply types of control charts and improvement of quality with analysis techniques.
CO 5	Use knowledge of management techniques in improving the Entreprise planning and project management.

UNIT-I

INTRODUCTION:

Concepts of Management and Organization – Functions of Management – Evolution of Management Thought : Taylor‟s Scientific Management, Fayol‟s Principles of Management, Douglas McGregor‟s Theory X and Theory Y, Mayo‟s Hawthorne Experiments, Hertzberg‟s Two Factor Theory of
Motivation, Maslow‟s Hierarchy of Human Needs, Systems Approach to Management.

UNIT-II

PLANT LOCATION & LAYOUT:

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites- methods for selection of plant.Types of production systems, Plant Layout – definition, objectives and types of plant layout.

UNIT-III

WORK STUDY:

Introduction, objectives of work study, steps in work study, purpose of method study, procedure of method study, recording techniques. Work measurement-purpose of work measurement, time studyprocedure-performance rating, standard time calculations (simple problems).

UNIT-IV

MATERIALS MANAGEMENT:

Objectives, Inventory – functions, types, associated costs, inventory controltechniques-ABC and VED analysis. Stores Management and Stores Records. Purchasemanagement duties ofpurchase of manager, associated forms, purchase procedure, methods of purchasing. Introduction to production planning and control (PPC) Objectives of PPC, Functions of PPC

UNIT-V

QUALITY CONTROL:

Meaning, process control, SQC control charts, single, double and sequential sampling, Introduction to TQM. Job Evaluation and merit rating: introduction-Job evaluation-objectives, benefits and limitations of job evaluation-methods of job evaluation.

Text Books:

1. DR. Ravi Shankar: Industrial Engineering and management/Galgotia publications pvt. Ltd.
2. Khanna O.P.: Industrial Engineering

Reference Books:

1. Industrial engineering and operations management by S.K. Sharma and Savita Sharma.
2. T.R. Banga : Industrial Engineering and Management
3. M. Mahajan: Industrial engineering and production management, DhanpatRai& Co.

<table>
<tr><td>Course Title</td><td colspan="4">Fundamentals of RADAR Engineering</td><td colspan="3">Open Electives</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE408</td><td rowspan="2">OE</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• To gain the knowledge about radar subsystems, their performance and key functions.
• To provide the in depth knowledge and issues related various tracking radars.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the essential principles of operation of radar systems.</td></tr>
<tr><td>CO 2</td><td colspan="8">Describe the various Radar components</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze different Radar systems</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze the different Tracking methods</td></tr>
</table>

UNIT-I

Fundamentals: Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Radar block diagram and operation, Radar frequencies, Applications of Radar, simple form of radar range equation. Integration of Radar pulses, Radar cross-Section of targets, PRF.

UNIT-II

Radar components: RF amplifier, TWT, CFA, Modulators, Mixers-Conversion loss, Noise figure, Types of Mixers, Duplexers-Branch type, Balanced and Solid state Duplexers, Displays-CRT displays, A, B, C, E-scopes, PPI, RHI.

UNIT-III

Radar systems: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, FMCW radar, multiple frequency C.W radar.

UNIT-IV

MTI and Pulse Doppler radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler radar.

UNIT-V

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse. Target Reflection Characteristics and Angular Accuracy. Tracking in

Range, Acquisition and Scanning Patterns. Comparison of Trackers.

Text Books:

1. Merrill I.Skolnik, “Introduction to Radar Systems”, 2^{nd} edition-TMH 1980.
2. N.S. Nagaraja, “Elements of electronic navigation, 2^{nd} edition-TMH 1996.

<table>
<tr><td>Course Title</td><td colspan="5">Biomedical Instrumentation</td><td colspan="3">Minor Degree</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2091409</td><td rowspan="2">EC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To Understand the functioning of Human Cell and its electrical characteristics
- To Understand the functioning of cardiovascular measurement and circulatory System of heart CO3: Describe various bioelectrodes
- To Describe Organization of cell and various potentials
- To Analyze the electrical hazards that may occur during the usage of medical instruments.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the functioning of Human Cell and its electrical characteristics
CO 2	Understand the functioning of cardiovascular measurement and circulatory System of heart
CO 3	Describe various bioelectrodes
CO 4	Describe Organization of cell and various potentials
CO 5	Analyze the electrical hazards that may occur during the usage of medical instruments.

UNIT I

Components of Medical Instrumentation System: Bio-amplifier, Static and dynamic characteristics of medical instruments. Bio-signals and characteristics. Problems encountered with measurements from human beings.

UNIT II

Organization of cell: Derivation of Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuro-muscular junction.

UNIT III

Bio Electrodes: Bio-potential Electrodes-External electrodes, Internal Electrodes. Biochemical Electrodes.Mechanical function, Electrical Conduction system of the heart, Cardiac cycle. Relation between electrical and mechanical activities of the heart. Pacemaker, Defibrillator

UNIT IV

Cardiac Instrumentation Blood pressure and Blood flow measurement: Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Therapeutic equipment, Shortwave diathermy.

Respiratory Instrumentation: Mechanism of respiration, Spirometry, Pnemuotachograph Ventilators.

UNIT V

Physiotherapy and Electrotherapy Equipment: High frequency heat therapy, Short wave Diathermy, Microwave Diathermy, Ultrasonic Therapy Unit, Electro diagnostic/ Therapeutic Apparatus, Pain relief through electrical stimulation, Diaphragm pacing by Radio-frequency for the treatment of chronic ventilator insufficiency, Bladder stimulators.

Patient electrical safety: Types of hazards, natural protective mechanism, leakage current, patient isolation, hazards in operation rooms, grounding conditions in hospital environment.

Text Books:

1. Leslie Cromwell and F.J. Weibell, "Biomedical Instrumentation andMeasurements ",E.A. Pfeiffer, PHI, 2nd Ed, 1980.
2. John G. Webster, "Medical Instrumentation, Application and Design",John Wiley,3rd Ed., 1998.

Reference Books:

1. L.A. Geoddes and L.E. Baker, " Principles of Applied Biomedical Instrumentation", John Wiley,1975.
2. R.S. Khandpur, " Hand-book of Biomedical Instrumentation", TMH, 2nd Ed.,2003.
3. Mackay, Stuart R., "Biomedical Telemetry",–John Wiley,1968.
4. M. Armugam, "Biomedical Instrumentation", Anuradha agenciespublications.

<table>
<tr><td>Course Title</td><td colspan="5">Digital Circuits</td><td colspan="3">Minor Degree</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2091410</td><td rowspan="2">EC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>-</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To provide fundamentals of number systems and Boolean Algebra.
- To learn the design of combinational and sequential circuits.
- To teach various memories and PLDs.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand various number systems and binary codes.
CO 2	Understand the postulates, theorems and properties of Boolean algebra.
CO 3	Describe the correlation between the Boolean expression and their corresponding logic diagram.
CO 4	Analyze Combinational & sequential logic circuits.
CO 5	Solve Switching functions using Programmable Logic Devices.

UNIT-I

Number Systems & Codes: Overview of number systems –complement representation of negative numbers- binary arithmetic, binary codes, code conversion, error detecting & error correcting codes –Hamming codes.

UNIT-II

Boolean Algebra and Minimization of Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties –Canonical and Standard forms- Minimal SOP and POS forms ,Algebraic simplification, digital logic gates –universal gates-Multilevel NAND/NOR realizations. The K- map method, tabulation method.

UNIT-III

Combinational Logic Design: Design using conventional logic gates, Half and Full Adders, Subtractors, Serial and Parallel Adders, Encoder, Decoder, Multiplexer, De-Multiplexer, Realization of switching functions using multiplexer, Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT-IV

Sequential Logic Design: Synchronous and Asynchronous sequential circuits, Flip-flops-Triggering and excitation tables, Flip flop conversions, shift registers, Design of Synchronous and Asynchronous counters, Ring and Johnson counters. Finite state machines (Mealy Model, Moore Model) and their representation, Designing synchronous Sequential circuits like Serial Binary adder, Sequence detector.

UNIT-V

Semiconductor Memories and Programmable Logic Devices: ROM- Internal structure, Static RAM and Dynamic RAM. Basic PLD"s-ROM, PROM, PLA, and PAL, Realization of Switching functions using basic PLD"s. Concept of PLD"s like CPLDs and FPGAs.

Text Books:

1. ZVI Kohavi, Switching & Finite Automata theory –, TMH, 2ndEdition.
2. Morris Mano, "Digital Design", PHI, 3rd Edition, 2006.
3. A. Anand Kumar, "Switching Theory & Logic Design", 2008, PHI.

Reference Books:

1. R. P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
3. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill,1989
4. William I. Fletcher, "An Engineering Approach to Digital Design", PHI.
5. Charles H. Roth, "Fundamentals of Logic Design", Thomson Publications, 5th Edition,2004.
6. John M. Yarbrough, "Digital Logic Applications and Design", Thomson Publications,

<table>
<tr><td>Course Title</td><td colspan="4">DATA ANALYTICS WITH PYTHON
(Open Elective Course – IV)</td><td colspan="4">B.Tech. VII Sem (R20UG) AI&ML</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE3907</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3 Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• Understand programming skills using basics of Python language
• To introduce the object-oriented programming concepts.
• Acquire basics of how to translate problem into object-oriented form
• To understand object-oriented programming concepts, and apply them in solvingproblems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Demonstrate and acquire knowledge on usage of Data types, operators, input andoutput statements in python programming.</td></tr>
<tr><td>CO 2</td><td colspan="8">Analyze the given problem and develop python program to solve the problem.</td></tr>
<tr><td>CO 3</td><td colspan="8">Able to use proper iterative statements in problem solving.</td></tr>
<tr><td>CO 4</td><td colspan="8">Entity the right sequence to solve the real-world problems.</td></tr>
<tr><td>CO 5</td><td colspan="8">Apply object-oriented features to solve real time applications.</td></tr>
</table>

UNIT - I

Features of python, Execution of a python program, comments, identifiers and variables, classification of data types, keywords, constants, Naming conventions in python, Operators andexpressions, operator precedence and associativity, input and output statements.

UNIT - II

Control statements: simple if, if..else, nested if, if..elif..else statement. **Loops:** while loop, for loop, nested loops, break, continue, pass and assert statements, Arrays in python, Strings and their operations.

UNIT - III

Functions: define and calling a function, return statement, formal and actual arguments, local and global variables, passing arguments to function, anonymous functions, example programs on functions, recursion.

UNIT - IV

Sequences: Lists, Tuples, Sets, Dictionaries, Operations and methods on Tuples, Lists, Dictionaries.
Files: Types of files, opening file, closing a file, write data into a file, read data from a file.

UNIT - V

Introduction to OOPS: Introduction to class and objects, self-variable in python, constructor, types of variables and methods, Inheritance and polymorphism, abstract class.

Text Books:

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
4. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018

Reference Books:

1. Python: The complete reference by Martin C Brown, McGraw-Hill Publication, 2018.
2. Programming Python, Mark Lutz,4th Edition, O'Reilly publications.
3. Dive into Python, Mark Pilgrim, A Press Media, LLC.

<table>
<tr><td>Course Title</td><td colspan="4">WEB DESIGNING USING PHP
(Open Elective Course – IV)</td><td colspan="4">B.Tech. VII Sem (R20UG) AI&ML</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours / Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE3908</td><td rowspan="2">OEC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- Familiarize the tags of HTML.
- Write backend code in PHP language and writing optimized front end code HTML and Java Script.
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement.

Course Outcomes: On successful completion of this course, the students will be able to

CO1	Enumerate the Basic Concepts of Markup Languages.
CO2	Develop web Applications using CSS and different page layout.
CO3	Make use of decisions, loops, strings in PHP
CO4	Make use of functions, creating HTML forms with PHP.
CO5	Accessing database through PHP.

UNIT – I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups.

Links and Navigation: Basic Links, Creating Links with the Element, Advanced E- mail Links.

Images, Audio, and Video: Adding Images Using the error! File name not specified Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.

Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables.

Forms: Introducing Forms, Form Controls, Sending Form Data to the Server.

Frames: Introducing Frameset, Element, Creating Links between Frames, setting a Default Target Frame Using Element, Nested Framesets, Inline or Floating Frames with.

UNIT – II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules.

CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model.

More Cascading Style Sheets: Links, Lists, Tables, Outlines, the focus and activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS.

Page Layout: Understating the Site’s Audience, Page Size, Designing Pages, coding your Design, Developing for Mobile Devices.

Design Issues: Typography, Navigation, Tables, Forms.

UNIT – III

Introducing PHP – What is PHP? Why PHP use? Evolution of PHP, Installing PHP, Other ways to run PHP, Creating your first script.

PHP Language Basics – Using variables, Understanding Data Types, Operators and Expressions, Constants.

Decisions and Loops – Making Decisions, Doing Repetitive Tasks with Looping, Mixing Decisions and Looping with HTML.

Strings – Creating and Accessing Strings, Searching Strings, Replacing Text with Strings, Dealing with Upper and Lowercase, Formatting Strings.

UNIT – IV

Arrays – Creating Arrays, Accessing Array Elements, Looping Through Arrays with for-each, Working with Multidimensional Arrays, Manipulating Arrays.

Functions – What is a Function? Why Functions are useful? Calling Functions, Working with Variable Functions, writing your own Functions, Working with References, Writing Recursive Functions.

Handling HTML Forms with PHP – How HTML form works, Capturing Form Data with PHP, Dealing with Multi-Value Fields, Generating Web Forms with PHP, Storing PHP Variables in Forms, Creating File Upload Forms, Redirecting After a Form Submission.

UNIT – V

Working with Files: Getting Information on Files, Opening and Closing Files, Reading and Writing to Files, Copying, Renaming, and Deleting Files.

Working with Databases and MySQL – Database Architectures, Database Models, Starting the MySQL Server, Setting Up the MySQL root Password, making a Connection, choosing a Database, creating a New Database, Reading Data, creating a Table, Adding Data to a Table, Reading Data from a Table, Updating Data in a Table, Deleting Data from a Table, Deleting Tables and Databases, Handling Errors.

Text Books:

1. Jon Duckett, Beginning HTML, XTML, CSS and JavaScript
2. Matt Doyle, Beginning PHP 5.3 (Wrox – Wiley Publishing)

Reference Books:

1. Chris Bates, Web Programming
2. Ralph Moseley and M. T. Savaliya, Developing Web Applications
3. P.J. Deitel & H.M. Deitel, Internet and World Wide Web How to program
4. W. Jason Gilmore, Beginning PHP and MySQL From Novice to Professional

<table>
<tr><td>Course Title</td><td colspan="4">OPERATIONS RESEARCH (R20)</td><td colspan="4">OPEN ELECTIVE - IV</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE617</td><td rowspan="2">Open Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>--</td><td>--</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hours</td></tr>
<tr><td colspan="9">Course Objectives:
The course is intended to identify and develop operations research models, understand the mathematical tools to solve optimization problems and develop a report that describes the model, the solving techniques and analyze the results.</td></tr>
<tr><td colspan="9">Course Outcome: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand various concepts of Operations research.</td></tr>
<tr><td>CO 2</td><td colspan="8">Apply linear programming to optimization techniques.</td></tr>
<tr><td>CO 3</td><td colspan="8">Discuss Transportation problem.</td></tr>
<tr><td>CO 4</td><td colspan="8">Solve Assignment problem.</td></tr>
<tr><td>CO 5</td><td colspan="8">Distinguish a game situation from a pure individual's decision problem and to explain concepts of players, strategies, payoffs, rationality.</td></tr>
</table>

UNIT I: Introduction to Operations research

Introduction, Models of Operations research, Advantages of Operations research, Limitations of Operations research

UNIT II: Linear Programming

Linear programming, Assumptions of linear programming, Properties of linear programming solution, Development of LP models, Graphical method, Simplex method.

UNIT III: Transportation Problem

Transportation problem, Mathematical model for transportation problem, Types of transportation problem, Starting solutions: North- West corner rule, Least cost method, Vogel's approximation method.

UNIT IV: Assignment Problem

Assignment problem – Hungarian method.

UNIT V: Game Theory

Introduction to Game Theory, Properties of a Game, Characteristics of Game Theory, Classification of Games, The Maximin-Minimax Principle, Two-Person and Zero-Sum Game, Games with Mixed Strategies, Method of finding out odds.

Text books:

1. Operations Research by N.K.Tiwari, Shishir K. Shandilya Prentice-Hall of India.
2. Operations Research by R. Pannerselvam, PHI Publications, 2nd Edition, 2012

3. Fundamentals of Operations Research, Prism publishers, Ackoff Russell LSasieni Maurice W.
4. Introduction to Operations Research, Cengage Publishers, Ecker Joseph Gkupferschmid Michael.

Reference Books:

1. Engineering Optimization by Singiresu S. Rao New Age International Publishers.
2. Operations Research by Kanthi Swarup, P.K.Gupta and Manmohan, S. Chand & Sons, 2004.
3. Introduction to Operations Research, TMH Publishers, Hiller Fredrick S, Lieberman Gerald J, Nag Bodhibr.
4. Introduction to Operations Research a Computer Oriented algorithmic, Gillett Billy E.

<table>
<tr><td>Course Title</td><td colspan="4">FUNDAMENTALS OF QUANTUM COMPUTATION AND NANO PHOTONICS</td><td colspan="4">OPEN ELECTIVE - 4</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">180E2618</td><td rowspan="2">BSC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End lab Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

COURSE OBJECTIVES:

1. This course outlines physically the intuitive concepts of quantum computation and nanophotonics using the concept of optical near-fields.
2. 2.Physics of information processing; quantum error correction; quantum communication, Optical near-field is an electromagnetic field that mediates the interaction between nanometric materials used for the realization of novel photonic devices, fabrication techniques, and systems.
3. Prior knowledge of quantum mechanics and photonics is helpful.

Course Outcomes: Upon completion of the course, the student will be able to:

CO1	**Explain** the concepts of Quantum mechanics.
CO2	**Understanding** the basic concepts of quantum computation.
CO3	**Identify** the different implementations of quantum computers.
CO4	**Analyze** the nanophotonics and its true nature
CO5	**Classify** the Interconnections for nanophotonics

UNIT –I: Quantum Mechanics

Introduction to Matter Waves - de Broglie Hypothesis - Heisenberg Uncertainty Principle - Schrodinger's time independent wave equation - Significance of wave function.

UNIT –II: Quantum Computing

Basic concepts of quantum mechanics – Stern - Gerlach Experiment - Qubits – Measurements – Gates - Quantum no-cloning and Teleportation.

UNIT -III: Error Correction and Implementations

Quantum Error-Correction - three-qubit bit flip code - five-qubit code - General properties of quantum error-correction.
First Experimental Implementations - Quantum optics implementations -NMR quantum information processing.

UNIT -IV: Nanophotonics

Photons and Electrons: Similarities and Differences - Confinement – Propagation-free space, Forbidden Zone: Tunneling.

UNIT – V: Nanophotonic systems

Nanotechnology- Photonics - Nanophotonics - Optical Nanomaterials - Nanoparticle Coatings - Sunscreen Nanoparticles - Self-Cleaning Glass - Fluorescent Quantum Dots – Nanobarcodes.

Text Books:

1. Quantum Computing Basics and Concepts by **S. M. Girvin - arXiv , 2013**
2. *Principles of Nanophotonics by* Motoichi Ohtsu, Kiyoshi Kobayashi, Tadashi Kawazoe, Takashi Yatsui and Makoto Naru -New York, USA: CRC Press-Taylor & Francis Group, 2008.
3.Paras. N. Prasad, Nanophotonics. New Jersey, USA:John Wiley & Sons Inc.,2004

Reference Books:

1.Quantum Computing by **John Watrous - University of Calgary , 2006**
2.Basic Concepts in Quantum Computing by **Artur Ekert, Patrick Hayden, Hitoshi Inamori – ar Xiv , 2000**
3. An Introduction to Quantum Computing for Non-Physicists” Eleanor Rieffel FX Palo Alto Labratory and Wolfgang Polak Consultant FX Palo Alto Laboratory.

<table>
<tr><td>Course Title</td><td colspan="4">Green Chemistry and Technology</td><td colspan="4">B. Tech.
(Open Elective-IV)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE619</td><td rowspan="2">Open Elective</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
• To make students aware of how chemical processes can be designed, developed and run in a sustainable way.
o Students acquire the competence to think of chemistry as a sustainable activity</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand the tolls & Principles of Green Chemistry</td></tr>
<tr><td>CO 2</td><td colspan="8">Knowledge of applications of green routes for synthesis of chemicals</td></tr>
<tr><td>CO 3</td><td colspan="8">Synthesis of biocatalysts using different techniques</td></tr>
<tr><td>CO 4</td><td colspan="8">Analyze about trends of solvent free chemical reactions</td></tr>
<tr><td>CO 5</td><td colspan="8">Better realization about reflections of Green Chemistry on sustainable development initiatives.</td></tr>
</table>

Unit-1: Fundamentals of Green Chemistry:
Discussion of the current state of chemistry and the environment and the definition of green chemistry. An introduction to the tools of green chemistry and its fundamental principles.
Learning Outcomes:
After completing this unit, the student will be able to
- Summarize the principles in green chemistry.
- Understand the importance of green chemistry in future development

Unit-2: Principles of Green Chemistry:
Prevention of waste / by-products, Hazardous products Designing of safer chemicals-Selection of appropriate solvents and starting materials- Use of protecting groups and catalysis- Designing of biodegradable products.
Learning Outcomes:
After completing this unit, the student will be able to
- Explain the importance of designing of safer chemicals.
- Interpret the need for selection of appropriate solvents and starting materials in chemical reactions.

UNIT-3: Catalysis for Green Chemistry:
Use of biocatalysts- Biochemical Oxidation, Biochemical Reduction, Modified biocatalysts- transition metal catalysis-Simmons-Smith reaction, Heak reaction, Ullmann's coupling.
Learning Outcomes:
After completing this unit, the student will be able to
- Know the use of biocatalysts.
- Explain transition metal catalysis reactions

UNIT-4: Synthesis of green chemistry

a) Solvent Free Reactions: Solvent free techniques- Reactions on solid mineral supports, Phase Transfer Catalysis- C-alkylation, N-alkylation.
b) Ultrasound assisted green synthesis Introduction to ultrasound assisted green synthesis, Hydroboration, Bouveault reaction.

Learning Outcomes:
After completing this unit, the student will be able to

- Explain solvent free reactions in green synthesis
- Understand the importance of ultrasound assisted Green synthesis

UNIT-5: Applications of Green Chemistry
Importance of Green chemistry in Sustainable development. Applications in Pharmaceutical Industry, Nanoscience, Chemical industry, Colour, Paper, polymer, Solar cells & in agriculture field.

Textbooks:

1. Engineering Chemistry, Fundamentals and Applications, Shikha Agarwal
2. Green Chemistry: Theory & Practice, Oxford University Press, Oxford publication, 1998
3. Green chemistry, Stanley E. Manahan, ChemChar Research, Inc publishers 2005.
4. Introduction to Green Chemistry, Second edition, Albert Matlack, CRC Press 2016

References:

1. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi, 2006.
2. Handbook of Green chemistry and technology, James H. Clark, Duncan J. MacQuarrie, Blackwell, Abingdon,2002
3. An Introduction Text on Green Chemistry, Indu Tucker Sidhwani, Rakesh K. Sharma, Wiley Publications
4. Green Organic Chemistry in Lecture and laboratory, Andrew P. Dicks & Michael C. Cann, T& F India publications.

<table>
<tr><td>Course Title</td><td colspan="4">Creative Writing</td><td colspan="3">OPEN ELECTIVE – IV</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20OE620</td><td rowspan="2">HUM</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Internal Assessment</td><td>External Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam: 90 Min</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To acquaint the learners with ideas related to creative writing including the art, the craft and the basic skills required for a creative writer
- To help learners to understand the principles of creative writing and the distinction between the literary genres
- To explain the differences in writing for various literary and social media
- To hone the creative and critical faculties of learners
- To enable learners to put into practice the various forms of creative writing that they have studied through the course

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Distinguish between the literary genres
CO 2	Write for various literary and social media
CO 3	Critically appreciate various forms of literature
CO 4	Make innovative use of their creative and critical faculties
CO 5	Seek employment in various creative fields

Unit I: Fundamentals of Creative Writing: (6 Hours)

Meaning and Significance of Creative Writing - Genres of Creative Writing: poetry, fiction, non-fiction, drama and other forms - Research for Creative Writing

Unit II: Elements of Creative Writing :(8 Hours)

Main elements of creative writing- Vocabulary improvement- often used Latin expressions in English- Idiomatic expressions.

Unit III: Forms of Creative Writing: (8 Hours)

Dialogue writing - Note making/Note taking - Short story writing - Expansion of an Idea / Proverb -Creative writing for marketing - Self-Narrative Writing

Unit IV: New Trends in Creative Writing (8 Hours)

Web Content Writing and Blog Writing- Script Writing- Journalistic Writing – Copywriting-

Graphic Novel- Flash Fiction

Unit V: Figurative Language

Literary Devices- Importance of figurative language in creative writing- Most common literary devices- Remedial grammar.

References:

- Creative Writing: A Beginner's Manual AnjanaNeira Dev. AnuradhaMarwah, Swati Pal Delhi,
  Pearson Longman, 2009.
- Abrams, M.H. Glossary of Literary Terms. Boston: Wadsworth Publishing Company,2005.
- Elements of Literature: Essay, Fiction, Poetry, Drama, Film. Robert Scholes, Nancy R. Comley, Carl H. Klaus, Michael Silverman Delhi, OUP, 2007.
- Write from the Heart: Unleashing the power of Your Creativity. Hal ZinaBennet California, New World Library,2001.
- A Guide to Writing about Literature, Sylvan Bamet, William E.Cain, New Delhi, Pearson, 2006.
- Atwood, Margaret. Negotiating with the Dead: A Writer on Writing. Cambridge: CUP,2002.
- Bell, Julia and Magrs, Paul. The Creative Writing Course-Book. London: Macmillan,2001.
- Earnshaw, Steven (Ed). The Handbook of Creative Writing. Edinburgh: EUP, 2007.
- Show, Mark. Successful Writing for Design, Advertising and Marketing. New York: Laurence King, 2012.
- Sugrman, Joseph .The Adweek Copywriting Handbook: The Ultimate Guide to WritingPowerful Advertising and Marketing Copy from One of America's Top Copywriters. NewYork: Wiley, 2009.

Cyber Resources:

http://www.chillibreeze.com/articles_various/creativewriter.asp

http://www.contentwriter.in/articles/writing/

http://www.cbse.nic.in/cw-xii/creative-writing-xii-unit-1.pdf.

Course Title	**Materials Management**					**B. Tech. Open Elective - IV**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20OE621	Open Elective (OEC)	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 90 Min						**End Exam Duration: 3Hrs**		

Course Objectives: The objective of the course is

- To understand how the knowledge of materials management can be an advantage to logistics and supply chain operations.
- To sensitize the students on the materials management functions – Planning, Purchase, Controlling, Storing, Handling, Packaging, Shipping and Distributing, and Standardizing
- To realize the importance of materials both in product and service.
- Use of TQM, JIT and SCM in managing materials.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Remembering the concepts of purchases, vendors, materials handling, inventory types etc.
CO 2	An understanding of basic concepts in Materials management and modern trends inmaterials management
CO 3	Analyze the processes of vendor management, material handling, ABC analysis andEOQ etc...
CO 4	An understanding of principle of materials handling and evaluation of material handling performance.
CO 5	Able to apply the techniques of inventory management.

Unit - I

Purchase Management: Overview, Purchase organization, Ethical Concepts in purchases, PurchaseParameters, purchase Methods. International Purchasing, International purchasing procedure.

Unit - II

Vendor Management: Vendor Evaluation - factors, advantages and disadvantages, parameters. Vendormanagement process. Recent trends in Vendor management

Unit - III

Materials Handling: Handling Principles, handling costs, unit load concept, flow pattern, materialhandling equipment's, evaluation of materials handling performance, safety in materials handling.

Unit - IV

Inventory Management: Types of Inventory, Costs Associated with Inventory, Inventory Control, Selective Inventory Control, Economic Order Quantity, ABC Analysis, Safety Stocks, Inventory Management Systems, Forecasting Techniques, Material Requirement Planning.

Unit - V

Computers in Materials Management: Introduction, Role of Computers in Materials Management: Advantages and Disadvantage of Computer in Materials Management, Materials Planning: Need for Materials Planning, Techniques of Materials Planning.

Text Book:

Material Management by K. ShridharaBhat

Reference Books:

1. Purchasing and Materials Management, P Gopalkrishnan,

2. Materials Management - An Integrated Approach, P Gopalkrishnan, M. Sundaresan, PHI.

3. Materials Management, Procedures, Text and Cases, A K Datta, PHI.

4. Production & Operation Management by K Ashwathappa, K ShridharaBhat

<table>
<tr><td>Course Title</td><td colspan="4">Human Resource Development (Humanities & Social Science Elective Course)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2006701</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To develop capability of all individuals working in an organization in relation to their present role
- To develop team spirit.
- To develop co-ordination among different units of an organization.
- To develop organization health by continuous reveal of individual capability keeping peace with the technological changes.
- To develop better interpersonal & employer-employee relationships in an organization.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	To understand key functions in management as applied in practice.
CO 2	To understand in more specific management related areas from planning till controlling.
CO 3	To understand about the authority and responsibility, and different organizational structure..
CO 4	To understand about the role of leadership, motivation and communication in an organization.
CO 5	To understand the importance of globalization and diversity in modern organizations.

UNIT- I

Introduction to Human Resource Development: Meaning, significance and objectives of Human Resource Development, Human Resource Management and Human Resource development functions, Human Resource Development challenges.

UNIT-II

HRD Need Assessment & Designing of HRD programs: Strategic/ Organizational Analysis- Task Analysis- Person Analysis- prioritizing HRD needs, defining the objectives of HRD Intervention - Selecting the trainer - Selecting the Training methods - Preparing training material Scheduling an HRD program.

UNIT- III

Implementation &Evaluation of HRD programs: Training methods - Classroom training Approaches - Computer based Training, Purpose of HRD Evaluation- Kirkpatrick's evaluation frame work - Data collection for HRD Evaluation - Assessing the impact of HRD programs in Monetary Terms.

UNIT-IV

Career Management and Development: Introduction to Career management, meaning - Stages of life and Career Development - process of career Development - Issues in career development.

UNIT-V

HRD & Diversity: Introduction – Organizational culture – Labor Market changes and discrimination adapting to demographic changes

Text Books:

1. Jon M Werner,Randy L DeSimone : Human Resource development (Thomson/Cengage)
2. Raymond A Noe : Employee Trainee Development (Tata McGraw Hill)

Reference Books:

1. John P. Wilson Human Resource Development (Kogan Page Business Books)
2. Tripathi P.C : Human Resource Development (Sultan Chand & Sons)
3. Uday Kumar Haldar : Human Resource Development (Oxford)

<table>
<tr><td>Course Title</td><td colspan="4">Digital Marketing
(Humanities & Social Science Elective Course)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2006702</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To provide foundation in the key concepts on digital marketing.
- Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.
- Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan.
- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn how to measure digital marketing efforts and calculate ROI

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the confluence of marketing, operations, and human resources in real-time delivery.
CO 2	Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
CO 3	Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
CO 4	Investigate and evaluate issues in adapting to globalized markets that are constantly changing and increasingly networked.
CO 5	Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.

UNIT - I

Understanding Digital Marketing Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

UNIT - II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How Different Segments use Digital Media - Digital Media for Customer Loyalty.

UNIT - III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

UNIT - IV

Search Engine Marketing and Online Advertising: Importance of SEM, Understanding Web Search – Keywords, HTML Tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-Click), Display Ads - Choosing a Display Ad Format, Landing Page and its Importance.

UNIT - V

Social Media Marketing: Understanding Social Media, Social Networking with Face book, LinkedIn, Blogging as a Social Medium, Social Sharing with YouTube. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Text Books:

1. Seema Gupta, Tata McGraw Hill.
2. Dave Chaffey, Pearson Education
3. Dr Antorny Puthussery

Reference Books:

1. Kevin Hartman, Digital Marketing Analytics,
2. Digital Marketing – Self learning management series, Vibrant Publishers
3. Digital Marketing, Vandana Ahuja, Oxford publishing house
4. Fundamentals of Digital Marketing, Puneet Singh Batia – Pearson Education
5. Digital Marketing by Seema Gupta (IIM-B)
6. Digital Marketing: Strategy, Implementation¬ & Practice by Dave Chaffey & Fiona Ellis Chad wick
7. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation - Damian Ryan and Calvin Jones.

<table>
<tr><td>Course Title</td><td colspan="5">Project Management
(Humanities & Social Science Elective Course)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2006703</td><td rowspan="2">HSMC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 90 Minutes</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
</table>

Course Objectives:

- To impart the basic concepts of Project selection.
- To develop an understanding of Project Planning and design, construction and execution, monitoring and control, completion.
- To achieve the Project's main goal within the constraints.
- To optimize the allocated necessary inputs.
- To shape and reform the client's vision or tone got late with the masregards the project's objectives.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Remembering and recalling the principles of project management and methods involved in the process of project management.
CO 2	UnderstandingofProjectPlanning,design,construction,execution,maintaining and controlling
CO 3	Applying techniques in Project Evaluation, Scheduling And Controlling.
CO 4	Classifying and analysis risks in Project management and project scheduling

UNIT-I

Introduction to Project Management: Need for Project management, Taxonomy of project, Project life cycle, Project management Process, Principles of Project Management. Project Identification and Selection, Pre – feasibility study, Project Planning Process, Resources allocation, Project Break-even Point.

UNIT- II

Financial Evaluation of Projects: Cost of the Project, Means of finance, Financial Evaluation of projects – Payback period method, Accounting Rate of Return method, Net Present Value method, Internal Rate of Return method, Benefit Cost Ratio method (Profitability Index), (simple Problems).

UNIT-III

Project Risk & Quality Management: Introduction, Role of Risk management, Risk Identification – Steps in risk management –, Risk analysis (Sensitivity Analysis, Probability Analysis, Mean – Variance Analysis Decision trees, Simulation), Techniques for managing risk. Project Quality Management And ValueEngineering:Quality,Quality Concepts and Value Engineering.

UNIT-IV

Project Scheduling (Network Analysis): Development of Project network, Timeestimation, Determination of the critical Path, PERT Model, Project Crashing.(Simple Problems).

UNIT-V

Project Execution & PMS: Process Of Project Execution and Control, Project Management Information System (PMIS), Project Performance Measurement and Evaluation (PPME).

ProjectManagementSoftware: Essential Requirement of Project Management Software, Common Features available in most of the project management software.

Text Books:

1. Project management Best Practices: Achieving Global Excellence by Harold Kerzner; John Wiley & Sons; 3rd edition.
2. Project Management: Engineering, Technology and Implementation: united states Edition by Avraham Shtub and Jonathan F.Bard, Pearson; 1st edition.
3. The Essentials of Project Management by Dennis Lock; Routledge.
4. PrasannaChandra,Projects,TataMcGrawHill.
5. NagarajanK,ProjectManagement4thedition,NewAgeInternational(P)Ltd.
6. LSSrinath,PERT/CPM,AffiliatedEast-WestPress2005.

Reference Books:

1. Project management by Stephen Hartley; Routledge, 4th Edition.
2. Project management: a systems Approach to Planning, Scheduling, and controlling by Harold Kerzner; Wiley; 12th edition.
3. Project Management & Appraisal by Sitangshu Khatua; published by Oxford University.
4. NicholasJ.M.&SteynH.,ProjectManagement,Elsevier,Himalayapublications.
5. Narendra Singh, Project Management and Control,HPH,2003.
6. Harvey Maylor, Project Management, Pearson Education.
7. Panneer selvam Senthil kumar,Project Management, PHI.

Course Title	Big Data Technologies / NASSCOM Courses				B.Tech VII Sem (R20) CSE		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2005710	**Skill Oriented Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	**0**	**4**	**2**	**40**	**60**	**100**
					End Exam Duration: 3Hrs			

Course Objectives:

- Optimize business decisions and create competitive advantage with Big data analytics.
- Practice java concepts required for developing map reduce programs.
- Impart the architectural concepts of Hadoop and introducing map reduce paradigm.
- Practice programming tools PIG and HIVE in Hadoop ecosystem.
- Implement best practices for Hadoop development.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the installation of VMW is and PIG.
CO 2	Understand and apply the setting up and Installing Hadoop in its three operating modes.
CO 3	Implement the file management tasks in Hadoop.
CO 4	Understand Map Reduce Paradigm.
CO 5	Understand Pig Latin scripts sort, group, join, project, and filter your data.

LIST OF EXPERIMENTS

1. A. To study of Big Data, Why is Big Data, Why Big Data is important?
   B. To Study of Big Data Analytics and Hadoop Architecture.
2. To study HDFS Commands.
3. Installation of VMW is to setup the Hadoop environment and its ecosystems.
4. A. Perform setting up and Installing Hadoop in its three operating modes.
   I. Standalone.
   II. Pseudo distributed.
   III. Fully distributed.
   B. Use web based tools to monitor your Hadoop setup.
5. Implementing the basic commands of LINUX Operating System File/Directory creation, deletion, and update operations.

6. Implement the following file management tasks in Hadoop:
   I. Adding files and directories
   II. Retrieving files
   III. Deleting files

   Hint: A typical Hadoop work flow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

7. Run a basic word count Map Reduce program to understand Map Reduce Paradigm.
8. Write a Map Reduce program that mines weather data.

   Hint: Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

9. Implement matrix multiplication with Hadoop Map Reduce.
10. Installation of PIG.
11. Write Pig Latin scripts sort, group, join, project, and filter your data.
12. A. Run the Pig Latin Scripts to find Word Count.
    B. Run the Pig Latin Scripts to find a max temp for each and every year.
13. HIVE OPERATIONS

    Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Text Books:

1. Tom White, Hadoop, "The Definitive Guide" , 3rd Edition, O'Reilly Publications,2012.
2. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, "Undetstanding Big Data Analytics for Enterprise class Hadoop and StreamingData", 1st Edition, TMH, 2012.
3. Bart Baesens, Analytics in a Big Data World: The Essential Guide to DataScience and its Applications, Wiley Publications, 2014.
4. Big Data Technologies and Applications, Borko Furht, Flavio Villanustre, Springer.

Reference Books:

1. Hand Book of Big Data Technologies, Albert Y. Zomaya, Sherif Sakr, Springer.
2. Big Data Analytics: Tools and Technology for Effective Planning, Arun K. Somani, Ganesh Chandra Deka, CRC Press.
3. Big Data, Big Analytics, Michael Minelli, Michele Chambers, Ambiga Dhiraj, John Wiley and Sons.

Course Title	Internship					B.Tech VII Sem (R20) CSE		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2005711	**INT**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	--	--	3	100	--	100
Internal Assessment								

Course Objectives:

- Develop and improve business skills in communication, technology, quantitative reasoning, and teamwork.
- Observe and participate in business operations and decision-making.
- Meet professional role models and potential mentors who can provide guidance, feedback, and support.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Assess interests and abilities in their field of study and Integrate theory and practice.
CO 2	Develop communication, interpersonal and other critical skills in the job interview process.
CO 3	Acquire employment contacts leading directly to a full-time job following graduation from college.
CO 4	Identify and carry out performance objectives related to their job assignment.

B.Tech VIII SEM CSE (R20)

<table>
<tr><td>Course Title</td><td colspan="4">Major Project</td><td colspan="3">B.Tech VIII Sem (R20) CSE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2005801</td><td rowspan="2">PROJ</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>-</td><td>-</td><td>-</td><td>12</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Internal Assessment:40</td><td colspan="4">External Assessment:60</td></tr>
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Course Objectives:

- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate a sound technical knowledge of their selected project topic.
CO 2	Understand problem identification, formulation and solution
CO 3	Design engineering solutions to complex problems utilizing a systems approach.
CO 4	Communicate with engineers and the community at large in written an oral form
CO 5	Demonstrate the knowledge, skills and attitudes of a professional engineer

GUIDELINES FOR PROJECT

The prime objective of the project work is to imbibe students with technical, analytical and innovative ideas. The students will able to learn theoretical and practical approaches pertaining to software applications development. A team of 4-5 students formed as a group and work under the supervision of a departmental faculty. Associating the students to solve real world problems identified within the department. 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.
4. Preparing an abstract on the selected 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 /Simulation as needed.
7. Final development of product/process conducting testing and specifying the results, conclusions and future scope.

8. Preparing a project report in the standard format for being evaluated by the Department Review Committee (DRC).
9. Final Project presentation / execution before Departmental Review Committee (DRC)

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<tr><td>Course Title</td><td colspan="5">Internship
(6 Months)</td><td colspan="3">B.Tech VII Sem (R20) CSE</td></tr>
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