R20 COURSE STRUCTURE AND SYLLABUS

For

B. Tech.

ELECTRONICS AND COMMUNICATIONENGINEERING

(*Applicable for batches admitted from 2020-21*)

PRAGATI ENGINEERING COLLEGE

(AUTONOMOUS)

Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with "A" Grade
Recognized byUGC 2(f) and 12(b) under UGC act, 1956

1-378, ADB Road, Surampalem – 533 437 Near Peddapuram, E.G.Dist, Andhra Pradesh

Institute Vision and Mission

Vision

To emerge as a Premier Institution for Technical Education in the Country through Academic Excellence and to be recognized as a Centre for Excellence in Research & Development, catering to the needs of our Country.

Mission

To realize a strong Institution by consistently maintaining State – of – Art – infrastructure, build a cohesive, World Class Team and provide need based Technical Education, Research and Development through enhanced Industry Interaction

Vision and Mission of the Department

Vision

To be an acknowledged Leader in providing quality education, training and research in area ofElectronics and Communication Engineering to meet the industrial and Societal needs.

Mission

- **M1:** To facilitate students with a state-of-the-art infrastructure, learning environment and value-based education to improve technical knowledge and skills for continuous learning process.
- **M2:** To impart high quality education with well qualified faculty and enable students to meet the challenges of the industry at global level
- **M3:** To promote innovation and active industry institute interaction by facilitating the students to improve their leadership and entrepreneurship skills with ethical values.

POs	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 engineeringproblems 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 designsystem 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 theinformation 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 withan understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assesssocietal, 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 solutionsin 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 the 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 engineeringcommunity 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 engineeringmanagement 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 lifelong learning in the broadest context of technological change.
PSOs	**Program Specific Outcomes**
PSO1	Ability to apply concepts in electronics and communication engineering, to design and implementcomplex systems in the areas related to analog and digital electronics , communication, signal processing ,VLSI& ES
PSO2	Ability to provide discerning solutions based on their expertise in electronics and communication courses in competitive examinations for successful employment, higher studies and research.

AUTONOMOUS COLLEGES OF JNTUK
COMMON ACADEMIC REGULATIONS (R20) FOR B. TECH PROGRAMME
(Applicable for from the Academic Year 2020-21)

1. Award of B. Tech. Degree

(a) A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:

(i) A student shall be declared eligible for the award of B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.

(ii) The candidate shall register for 160 credits and secure all the 160 credits.

(b) The medium of instruction for the entire under graduate programme in Engineering & Technology will be in **English** only.

2. Programme Pattern:

a) Total duration of the of B. Tech (Regular) Programme is four academic years

b) Each Academic year of study is divided into **Two Semesters**.

c) Minimum number of instruction days in each semester is 90.

d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

e) The total credits for the Programme is 160.

f) Three week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

g) Student is introduced to "Choice Based Credit System (CBCS)".

h) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

i) A student has to register for all courses in a semester.

j) All the registered credits will be considered for the calculation of final CGPA.

k) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

l) A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.

m) All the students shall be mandatorily registered for NCC, NSS activities and Community Service Project as per the Government and University norms.

n) Each college shall assign a faculty advisor/mentor after admission to each student or group of

students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.

3. **Registration for Courses:**
   a) In each semester a student shall mandatorily register courses which he/she wishes to pursue within a week from the starting of the class work with the advice of Head of the Department and mentor ofthe student of the concerned department of the college.
   b) If any student wishes to withdraw the registration of the course, he/she shall submit a letter to the Principal of the college through the Head of the Department and mentor within fifteen days.
   c) The concerned college shall thoroughly verify and upload the data/courses registered by each student in the university examination center within 20 days. The Principal of the concerned college shall ensure that there no wrong registration courses by the student. The university registration portal will be closed after 20 days.

4. **(a) Award of B. Tech. Degree:** A student will be declared eligible for the award of B. Tech. Degree ifhe fulfills the following academic regulations:
   i. A student shall be declared eligible for award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.
   ii. The student shall register for 160 credits and must secure all the 160 credits.
   iii. All students shall mandatorily register for the courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure at least 40% of the marks allotted in the internal evaluation for passing the course and shall maintain 75% of attendance in the subject.
   iv. All students shall mandatorily register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
   v. Credits are defined as per AICTE norms.

   (b) Award of B. Tech. (Honor)/B. Tech. (Minor)**:** B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. The regulations/guidelines are separately provided. Registering for an Honors/Minor is optional.

5. **Attendance Requirements**
   a) A student is eligible to write the University examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

c) Shortage of Attendance below 65% in aggregate shall not be condoned.

d) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

f) A stipulated fee of Rs. 500/- in the concerned semester shall be payable towards condonation of shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.

g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligiblefor readmission into the same class.

i) For induction programme attendance shall be maintained as per AICTE norms.

j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

6. Evaluation-Distribution and Weightage of marks

(i) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down bythe University Examination section from time to time.

(ii) To maintain the quality, external examiners and question paper setters shall be selected from reputedinstitutes like IISc, IITs, IIITs, IISERs, NITs and Universities.

(iii) For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

(iv) A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

(v) Distribution and Weightage of marks:

The assessment of the student's performance in each course will be as per the details given:

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Engineering Graphics/Design/Drawing	30	70	100
3	Practical	15	35	50
4	Mini Project/Internship/Industrial Training/ Skill Development programmes/Research Project	-	50	50
5	Project Work	60	140	200

(vi) Continuous Internal Theory Evaluation:

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (20 multiple choice questions) for 10 marks for a duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for a duration of 90 minutes and (iii) one assignment for marks. All the internal exams shall be conducted as per university norms from first 50% of the syllabi.

b) In the similar lines, the second online, descriptive examinations assignment shall be conducted onthe rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the University examination section within one week after completion of first mid examination.

d) The mid marks submitted to the University examination section shall be displayed in the concerned college notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of online objective examination, descriptive examination and assignment shall also be submitted to University examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission.

g) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

Mid-1 marks = Marks secured in (online examination-1+descriptive examination-1 +one assignment-1)

Mid-2 marks = Marks secured in (online examination-2+descriptive examination-2 +one assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, university examination section will send mid marks of all subjects in consolidated form to all the concerned colleges and same shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of university examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

(vii) Semester End Theory Examinations Evaluation:

a) The semester end examinations will be conducted university examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b) For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day to day work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.

c) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.

d) Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects andalso in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor hasto be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirementsare as per the norms of the University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.

e) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.

f) Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

g) **Procedure for Conduct and Evaluation of MOOC:** There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be pass.

h) *Major Project (*Project - Project work, seminar and internship in industry):

In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

7. Results Declaration:

(i) Before results declaration, an academic council meeting shall be conducted and results shall be placedbefore the academic council for approval.

(ii)With the approval of academic council, the results shall be submitted to the University to get theapproval from Honorable Vice-Chancellor.

(iii) The University may normalize the result, if required, before declaration of the result (Guidelines fornormalization will be provided separately)

(iv) A copy of approved results in a CD shall be submitted to the University examination Center.

8. Academic Audit: Academic audit in each semester will be conducted as per norms.

9. Recounting or Re-evaluation of Marks in the End Semester Examination: A student can request forrecounting of revaluation of his/her answer book on payment of a prescribed fee as per university norms.

10. Supplementary Examinations: A student who has failed to secure the required credits can appear for asupplementary examination, as per the schedule announced by the University.

11. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/Endexaminations as per the rules framed by the University.

12. Promotion Rules

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5 for promotion to higher classes

a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per University norm.

b) A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether ornot the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

13. Course Pattern

a) The entire course of study is for four academic years; all years are on semester pattern.

b) A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.

c) When a student is detained for lack of credits / shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

14. Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below. Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned. For project same % percentages will be followed for grading.

Marks Range Theory (Max – 100)	**Marks Range Lab (Max – 50)**	**Level**	**Letter Grade**	**Grade Point**
≥ 90	≥ 45	Outstanding	A+	10
≥80 to <89	≥40 to <44	Excellent	A	9
≥70 to <79	≥35 to <39	Very Good	B	8
≥60 to <69	≥30 to <34	Good	C	7
≥50 to <59	≥25 to <29	Fair	D	6
≥40 to <49	≥20 to <24	Satisfactory	E	5
<40	<20	Fail	F	0
-		Absent	AB	0

15. Award of Class

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

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

16. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days. There shall be no branch transfers after the completion of the admission process. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

17. Withholding of Results

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

18. Transitory Regulations

a) Discontinued or detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules & regulations under which the candidate hasbeen admitted.

c) (i) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by JNTUK.

19. Gap - Year

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

20. General

a) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

b) The academic regulation should be read as a whole for the purpose of any interpretation.

c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

d) The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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ACADEMIC REGULATIONS (R19) FOR B. TECH. (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2020-21 onwards

1 **Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the followingacademic regulations:

a) A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years. After six academic years from the year of their admission, he/she shall **forfeit** their seat in

B. Tech course and their admission stands cancelled.

b) The candidate shall register for 121 credits and secure all the 121 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech (lateralentry).

3. Promotion Rules

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfills the academic requirementsof 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. Award of Class

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

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 121 Credits from II Year to IV Year
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in thememorandum of marks.

5. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) willhold good for B. Tech. (Lateral Entry Scheme)**

COMMUNITY SERVICE PROJECT

Introduction

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

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigencywhen students cannot pursue their summer internships. The specific objectives are;

1. To sensitize the students to the living conditions of the people who are around them,

2. To help students to realize the stark realities of the society.

3. To bring about an attitudinal change in the students and help them to develop societal consciousness,sensibility, responsibility and accountability

4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.

5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.

6. To help students to initiate developmental activities in the community in coordination with public andgovernment authorities.

7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

1. Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of peoplelike - youth, women, house-wives, etc

4. A log book has to be maintained by each of the student, where the activities undertaken/involved tobe recorded.
5. The log book has to be countersigned by the concerned mentor/faculty in charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conductedby a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable themto commute from their residence and return back by evening or so.

2. The Community Service Project is a twofold one –

a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry
- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy

- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

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

Personal Outcomes

1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
2. Greater interpersonal development, particularly the ability to work well with others, and buildleadership and communication skills

Social Outcomes

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

Career Development

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

Relationship with the Institution

1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

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

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

1. Improved institutional commitment

2. Improved student retention
3. Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

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

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

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

For Engineering Students

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

22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

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

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps

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

Programmes for Youth Empowerment

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

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

1. Students may not have the expertise to conduct all the programmes on their own. The students thencan play a facilitator role.
2. For conducting special camps like Health related, they will be coordinating with the Governmentalagencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club,Rotary Club, etc or with any NGO actively working in that habitation.
5. And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
6. An in-house training and induction programme could be arranged for the faculty and participatingstudents, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

a) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.

b) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.

c) The Governmental agencies, like revenue administration, corporation and municipal authoritiesand village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (Two Weeks)

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Four Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	**Punishment**
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action and impose suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show because notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than oneyear.

* * * * *

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
For Constituent Colleges and Affiliated Colleges of JNTUK

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I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	20HE1T01	Professional Communicative English	3	0	0	3
2	20BM1T01	Differential Equations and Numerical Methods	3	0	0	3
3	20BC1T02	Applied Chemistry	3	0	0	3
4	20CS1T01	Programming for Problem Solving Using C	3	0	0	3
5	20ME1T02	Engineering Drawing	1	0	4	3
6	20HE1L01	Professional Communicative English Laboratory	0	0	3	1.5
7	20BC1L02	Applied Chemistry Laboratory	0	0	3	1.5
8	20CS1L01	Programming for Problem Solving Using C Laboratory	0	0	3	1.5
		Total Credits				**19.5**

I Year – II SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	20BM2T02	Linear Algebra and Partial Differential Equations	3	0	0	3
2	20BP2T02	Applied Physics	3	0	0	3
3	20CS2T04	Object Oriented Programming through Java	3	0	0	3
4	20EC2T01	Network Analysis	3	0	0	3
5	20EE2T03	Basic Electrical Engineering	3	0	0	3
6	20EC2L01	Electronic workshop	0	0	3	1.5
7	20EE2L03	Basic Electrical Engineering Laboratory	0	0	3	1.5
8	20BP2L02	Applied Physics Laboratory	0	0	3	1.5
9	20BE2T01	Environmental Science	3	0	0	0
Total Credits						**19.5**

II Year I Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	BSC	Mathematics-III (Transforms & Vector Calculus)	20BM3T03	3	0	0	3
2	PCC	Signals and Systems	20EC3T04	3	0	0	3
3	PCC	Electronic Devices and Circuits	20EC3T05	3	0	0	3
4	PCC	Switching Theory and Logic Design	20EC3T06	3	0	0	3
5	ESC	Data Structures	20IT3T01	3	0	0	3
6	ESC (LAB)	OOPS through Java Lab	20CS3L12	0	0	3	1.5
7	PCC (LAB)	Electronic Devices and Circuits Lab	20EC3L02	0	0	3	1.5
8	PCC (LAB)	Switching Theory and Logic Design Lab	20EC3L03	0	0	3	1.5
9	SOC*	Interactive Programming	20EC3S01	0	0	4	2
10	Mandatory course	Constitution of India	20HM3T05	2	0	0	0
						Total credits	**21.5**

II Year II Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	PCC	Electronic Circuit Analysis	20EC4T07	3	0	0	3
2	PCC	Digital IC Applications	20EC4T08	3	0	0	3
3	PCC	Control Systems	20EC4T09	3	0	0	3
4	PCC	Random Variables and Stochastic Process	20EC4T10	3	0	0	3
5	ESC	Python Programming	20CS4T03	3	0	0	3
6	ESC (LAB)	Python Programming Lab	20CS4L03	0	0	3	1.5
7	PCC (LAB)	Electronic Circuit Analysis Lab	20EC4L04	0	0	3	1.5
8	PCC (LAB)	Digital IC Applications Lab	20EC4L05	0	0	3	1.5
9	SOC*	IoT Applications	20EC4S02	0	0	4	2
						Total credits	**21.5**
Internship 2 Months (Mandatory) during summer vacation							

III Year I Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	PCC	Analog ICs and Applications	20EC5T11	3	0	0	3
2	PCC	Electromagnetic Waves and Transmission Lines	20EC5T13	3	0	0	3
3	PCC	Analog and Digital Communications	20EC5T14	3	0	0	3
4	OEC	**Open Elective courses 1**					
		Surveying	20CE5T01	3	0	0	3
		Renewable Energy Engineering	20EE5T13	3	0	0	3
		Operations Research	20ME5T21	3	0	0	3
		Deep Learning	20AM5T03	3	0	0	3
		Entrepreneurship	20HM5T03	3	0	0	3
5	PEC	**Professional Elective courses -1**					
		Antenna and Wave Propagation	20EC5T16	3	0	0	3
		Electronic Measurements and Instrumentation	20EC5T17	3	0	0	3
		Computer Architecture & Organization	20EC5T18	3	0	0	3
6	ECC	Analog ICs and Applications LAB	20EC5L06	0	0	3	1.5
7	ECC	Analog and Digital Communications Lab	20EC5L07	0	0	3	1.5
8	SOC	Soft Skills and Interpersonal Communication	20HE5S01	1	0	2	2
9	MCC	Essence of Indian Traditional Knowledge	20HM5T06	2	0	0	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester				0	0	0	1.5
11	Project	Community Service Project	20EC5P01	0	0	0	4
						Total credits	**25.5**

Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**4**	**0**	**0**	**4**

III Year II Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	PCC	Microprocessor and Microcontrollers	20EC6T21	3	1	0	3
2	PCC	VLSI Design	20EC6T22	3	0	0	3
3	PCC	Digital Signal Processing	20EC6T23	3	0	0	3
4	PEC	**Professional Elective courses - 2**					
		Microwave Engineering	20EC6T27	3	0	0	3
		Mobile & Cellular Communication	20EC6T28	3	0	0	3
		CMOS Analog IC Design	20EC6T29	3	0	0	3
5	OEC	**Open Elective courses 2**					
		Disaster Management	20CE6T35	3	0	0	3
		Fundamentals of Electric Vehicles	20EE6T19	3	0	0	3
		Introduction to Automobile Engineering	20ME6T25	3	0	0	3
		Computer Forensics	20CS6T15	3	0	0	3
6	ECC	Microprocessor and Microcontrollers - Lab	20EC6L08	0	0	3	1.5
7	ECC	VLSI Design Lab	20EC6L09	0	0	3	1.5
8	ECC	Digital Signal Processing Lab	20EC6L10	0	0	3	1.5
9	SOC	Arm/Aurdino based Programming	20EC6S03	1	0	2	2
10	MC	Research Methodology	20HM6T10	2	0	0	0
			Total credits				**21.5**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation							

Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**4**	**0**	**0**	**4**

IV Year I Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	PEC	**Professional Elective courses -3**					
		Optical Communication	20EC7T31	3	0	0	3
		Digital Image Processing	20EC7T32	3	0	0	3
		Low Power VLSI Design	20EC7T33	3	0	0	3
2	PEC	**Professional Elective courses -4**					
		Satellite Communications	20EC7T34	3	0	0	3
		Embedded Systems	20EC7T35	3	0	0	3
		Digital IC Design using CMOS	20EC7T36	3	0	0	3
3	PEC	**Professional Elective courses -5**					
		Radar engineering	20EC7T37	3	0	0	3
		Internet of Things	20EC7T38	3	0	0	3
		Pattern recognition & Machine Learning	20EC7T39	3	0	0	3
4	OEC	**Open Elective courses 3**					
		Highway Engineering	20CE7T11	3	0	0	3
		Battery Management Systems and Charging Stations	20EE7T29	3	0	0	3
		Additive Manufacturing	20ME7T28	3	0	0	3
		Big data analytics	20DS7T02	3	0	0	3
		Organizational behavior	20HM7T09	3	0	0	3
5	OEC	Open Elective courses 4					
		Water resource Engineering	20CE7T13	3	0	0	3
		Smart Grid Technologies	20EE7T30	3	0	0	3
		Sustainable Energy Technologies	20ME7T38	3	0	0	3
		Cryptography and network security	20IT7T10	3	0	0	3
		Marketing Management	20HM7T04	3	0	0	3
6	HSC	Universal Human Values-II Understanding Harmony	20HM7T11	3	0	0	3
7	SOC	Designer tools (HFSS, Microwave Studio CST. Cadence Virtuoso. Synopsys, Mentor Graphics, Xilinx.)	20EC7S04	1	0	2	2
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester				0	0	0	3
			Total credits				**23**

Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)	**4**	**0**	**0**	**4**

IV Year II Semester

S No	Category	Course Title	Course Code	Hours per week			Credits
				L	T	P	
1	PROJ	Project work, seminar and internship in industry	20EC8P02	-	-	-	8
INTERNSHIP (6 MONTHS)							
						Total credits	**8**

Professional Communicative English

Common to CE, EEE, MECH, ECE, CSE, CSE (DS), CSE (AI&ML), & IT

I B. Tech I Semester

Course Category		**Course Code**	20HE1T01
Course Type	Humanities	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Emphasizes that the ultimate aim of Education is to enhance wisdom and inspires the readers to serve their nation with their self enrichment.	K2
CO2	Enables the learners to promote peaceful co-existence and universal harmony in society and empowers them to initiate innovation.	K2
CO3	Imparts the students to manage different cultural shock due to globalization and develop multiculturalism to appreciate diverse cultures and motivate them to contribute to their nation	K3
CO4	Arouses the thought of life to lead in the right path by recognizing the importance of work besides enhancing their LSRW skills.	K2
CO5	Inspires the learners at the advancement of software by the eminent personalities and motivates the readers to think and tap their innate talents.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1						2				2		
CO2								2		3		
CO3						2				2		
CO4										2	2	
CO5										2	2	

COURSE CONTENT	
UNIT I	The Greatest Resource- Education' from Professional Communicative English. Objective: Schumacher describes the education system by saying that it was mere training, something more than knowledge of facts. Outcome: Underscores that the ultimate aim of Education is to enhance wisdom. War' from _Panorama: A Course on Reading' Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills
UNIT II	' A Dilemma' from Professional Communicative English. Objective: The lesson centres on the pros and cons of the development of science and technology. Outcome: Enables the students to promote peaceful co-existence and universal harmony among people in society 'The Verger' from _Panorama: A Course on Reading' Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills
UNIT III	'Cultural Shock': Adjustments to new Cultural Environments from Professional Communicative English. Objective: Depicts of the symptoms of Cultural Shock and the aftermath consequences Outcome: Enables the students to manage different cultural shocks due to globalization. ' The Scarecrow' from Panorama: A Course on Reading Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills
UNIT IV	_The Secret of Work‘ from Professional Communicative English. Objective: Portrays the ways of living life in its real sense. Outcome: Arouses the thoughtto lead life in a right path by recognizing the importance of work. 'A Village Lost to the Nation' from Panorama: A Course on Reading Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills
UNIT V	' The Chief Software Architect' from Professional Communicative English. Objective: Supports the developments of technology for the betterment of human life. Outcome: Pupil gets inspired by eminent personalities who toiled for the present-day advancement of software development. 'Martin Luther King and Africa' from Panorama: A Course on Reading Objective: To develop extensive reading skill and comprehension for pleasure and profit. Outcome: Acquisition of LSRW skills

TEXT BOOKS	
1.	PANORAMA: A COURSE ON READING, Published by Oxford University Press India The course content, along with the study material, is divided into six units

Differential Equations and Numerical Methods

(Common to CE, EEE, ME, ECE, CSE,CSE-DS, CSE-AI&ML& IT)

I B. Tech I Semester

Course Category	Basic Sciences	**Course Code**	20BM1T01
Course Type		**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	solve first order differential equations and its applications	K3
CO2	solve the linear differential equations with constant coefficients by appropriate method	K3
CO3	apply Newton, Gauss and Lagrange interpolation formulae to find interpolating polynomials for the given data.	K3
CO4	find the approximate roots of transcendental equations by using different numerical methods	K2
CO5	solve initial value problems by using different numerical schemes	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2									
CO2	3	3	3									
CO3	3	3	2									
CO4	3	3	2									
CO5	3	3	2									

COURSE CONTENT	
UNITI	**Differential equations of first order and first degree** Linear – Bernoulli – Exact – Reducible to exact. **Applications:** Newton‘s Law of cooling – Law of natural growth and decay – Orthogonal trajectories.
UNITII	**Linear differential equations of higher order** Non-homogeneous equations of higher order with constant coefficients with non- homogeneous form polynomials in $x^n, e^{ax}V(x), x^mV(x)$ - Method ofVariation of parameters.
UNITIII	**Interpolation** Introduction– Errors in polynomial interpolation – Finite differences – Forward differences–Backward differences –Central differences –properties – Differences of a polynomial- Newton‘s formulae for interpolation –Gauss formulae for interpolation- Interpolation with unequal intervals: Lagrange‘s interpolation formula.
UNITIV	**Solution of Algebraic and Transcendental Equations** Introduction- Bisection method – Method of false position – Iteration method – Newton-Raphson method (One variable).
UNIT-V	**Solution of Ordinary Differential equations** Solution of ordinary differential equations by Taylor‘s series-Picard‘s method of successiveapproximations-Euler‘s method – Modified Euler‘s method - Runge-Kutta method (second and fourth order).

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O’neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
WEB RESOURCES	
1.	**UNIT I: Differential equations of first order and first degree** http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
2.	**UNIT II: Linear differential equations of higher order** http://um.mendelu.cz/maw-html/index.php?lang=en&form=ode https://nptel.ac.in/courses/122107037/20
3.	**UNIT III: Interpolation** https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Interpolation
4.	**UNIT IV: Solution of Algebraic and Transcendental Equations** https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving https://www.slideshare.net/100005232690054/algebraic-and-transcendental-equations
5.	**UNIT V: Solution of Ordinary Differential Equations** https://nptel.ac.in/courses/111107063/ https://www.facweb.iitkgp.ac.in/~rajas/cgen/page/nptlcrs

Applied Chemistry

I B. Tech I Semester

Course Category	Basic Sciences	**Course Code**	20BC1T02
Course Type	Theory	**L-T-P-C**	3 – 0 – 3 – 4.5
Prerequisites	Intermediate Chemistry	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about the hardness of water, boiler troubles, Drinking water standards and methods ofremoval of hardness of water.
2	To get knowledge on Electrochemical cells, Batteries, fuel cells and fuels and their applications.
3	To study about the factors affecting corrosion and their controlling methods.
4	To learn about Cement, its setting and hardening and about Polymers, Plastics and Elastomers.
5	To study about Nano materials, their preparation, and applications and to create awareness onsurface chemistry.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Compare the quality of drinking water with BIS and WHO Standards	K2
CO2	Illustrate the principles and applications of Batteries, Fuel cells and fuels.	K3
CO3	Identify different types of corrosion and their controlling methods.	K3
CO4	Illustrate the principles of setting and hardening of cement and explain aboutpolymers and their engineering applications.	K2
CO5	Analyze the importance of nano materials and surface chemistry.	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT	
UNIT I	**WATER TECHNOLOGY** Introduction –Hard and Soft water, Estimation of Hardness by EDTA Method - Boiler troubles - Scale and Sludge- Specifications for Drinking water, Bureau of Indian Standards (BIS) and World Health Organization (WHO) standards, Zeolite and Ion-Exchange processes- Desalination of Brackish water, Reverse Osmosis (RO) and Electro Dialysis. **Learning Outcomes:** The student will be able to List the differences between temporary and permanent hardness of water (L1) Explain the Principles of Reverse Osmosis and Electro dialysis. (L2) Compare quality of Drinking water with BIS and WHO standards. (L2) Illustrate Disadvantages associated with hard water. (L2)
UNIT II	**ENERGY SOURCES AND APPLICATIONS** **10hrs** **Electrodes:** Electrode potential, Determination of Single Electrode Potential –Nernst‘s equation, Reference electrodes: Hydrogen and Calomel electrodes **Batteries:** Primary cell- Dry or Leclanche cell, Secondary cell- Lithium batteries (Lithium- MnO2); **Fuel cells:** H2-O2 fuel cell, Methanol fuel cell **Fuels-** Types of fuels, Calorific value, Numerical problems based on Calorific value; Analysis of Coal, Liquid fuels : Refining of Petroleum, Cracking: Catalytic cracking- Fixed bed and Moving bed methods, Knocking and Anti knocking agents, Octane and Cetane Values. **Biofuels** – Bio Diesel, Power Alcohol. **Learning Outcomes:** At the end of this unit, the students will be able to Apply Nernst equation for calculating electrode and cell potentials (L3) Compare different batteries and their applications (L2) Explain calorific values, octane number, refining of petroleum and cracking of oils (L2)
UNIT III	**CORROSION AND ITS CONTROLLING METHODS** **6+6 hrs** **III-A: Corrosion:** Definition – Theories of Corrosion-Dry corrosion: Metal oxide formation - Pilling Bed Worth ratio; Electro Chemical Corrosion: Mechanism, Factors affecting the Corrosion rate (pH, temperature, DO). **III-B: Corrosion Controlling Methods:** Sacrificial and Impressed Current Cathodic Protection. Metallic Coatings – Galvanizing and Tinning- Electro Plating and Electroless Plating. **Learning Outcomes:** At the end of this unit, the students will be able to Apply Pilling Bedworth rule for Corrosion and Corrosion Prevention (L3) Demonstrate the corrosion prevention methods and factors affecting corrosion (L2)
UNIT IV	**POLYMER CHEMISTRY AND CEMENT** **10 hrs** **Polymers**: Introduction- Functionality of Monomers, Chain (Addition) Polymerization, Step(Condensation) Polymerization, Co-Ordination Polymerization, Co Polymerization with examples and Mechanism.

	Conducting Polymers – Mechanism of Conduction in Poly acetylene, Poly aniline and their Applications, **Plastics**: Thermoplastics and Thermo Setting Resins; Preparation, Properties and Applications of Polystyrene and Bakelite. **Elastomers**: Preparation, Properties and applications of Buna-S and Thiokol. **Cement:** Portland Cement, Constituents, Manufacture of Portland Cement, Chemistry of Setting and Hardening of Cement. **Learning Outcomes:** At the end of this unit, the students will be able to Explain different types of polymers and their applications (L2) Demonstrate the mechanism of conduction in conducting polymers (L2) Identify the constituents of Portland cement and explanation of the manufacturing of cement(L2) Enumerate the reactions at different temperatures in the Manufacture of Cement (L2)
UNIT V	**NANOMATERIALS AND SURFACE CHEMISTRY** **8 hrs** **Nanomaterials:** Introduction, Preparation of Carbon Nano Tubes (CNTs) by Arc dischargeand Chemical Vapor Deposition Methods. Fullerenes -Preparation, Properties and Applications. Chemical synthesis of Nanomaterials: Sol-gel method, Applications of Nanomaterials inWastewater treatment, Medicine and ***in Lubricants*.** **Surface Chemistry:** Introduction to Surface Chemistry, Colloids, Nanometals and Nanometal Oxides, Functionalization of Surface of Nanomaterials, Applications of Colloids and Nanomaterials in Catalysis and Sensors. **Learning Outcomes:** At the end of this unit, the students will be able to Classify Nanomaterials. (L-2) Explain the Synthesis and applications of Nanomaterials. (L-2) Identify the application of Colloids and Nanomaterials in Medicine, Sensors and Catalysis(L2)

TEXT BOOKS	
1.	P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2.	Engineering Chemistry by Shikha Agarwal: Cambridge University Press,2019 edition .
REFERENCE BOOKS	
1.	Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2.	S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
3.	N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014)

Programming for Problem solving using C

I B.Tech I Semester

(Common to CE, ME, EEE, ECE, CSE, CSE (AI&ML),CSE(DS), IT)

Course Category	Engineering Science	**Course Code**	20CS1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End** **ExaminationTotal Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2	To gain knowledge of the operators, selection, control statements and repetition in C
3	To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
4	To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5	To assimilate about File I/O and significance of functions

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the fundamentals of C Programming for Problem solving.	K3
CO2	Identify the appropriate Decision statement and Loops for a given Problem.	K2
CO3	Make use of Arrays and Strings to solve the problems in C.	K3
CO4	design and implement programs to analyze the different pointer applications	K3
CO5	Develop solutions for problems using Files and Functions.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	1	0	0	0	0	0	0	0	1	1
CO2	3	3	3	3	1	0	0	0	0	0	0	0	1	1
CO3	3	3	3	2	1	0	0	0	0	0	0	0	2	1
CO4	2	3	3	3	1	0	0	0	0	0	0	0	2	2
CO5	3	3	3	3	1	0	0	0	0	0	0	0	2	2

COURSE CONTENT	
UNIT I	**Introduction to Computers**: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers **Introduction to the C Language:** Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers. **Structure of a C Program:** Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.
UNIT II	**Bitwise Operators**: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. **Selection & Making Decisions**: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions. **Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.
UNIT III	**Arrays:** Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages **Strings:** String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.
UNIT IV	**Pointers:** Introduction, Pointers to pointers, Compatibility, L value and R value Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory AllocationFunction, Array of Pointers, Programming Application. Processor Commands: Processor Commands.
UNIT V	**Functions:** Designing, Structured Programs, Function in C, User Defined Functions, Inter- Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers toFunctions, Recursion **Text Input / Output:** Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS	
1.	Programming for Problem Solving, Beerhouse A. Forouzan, Richard F.Gilberg, CENGAGE.
2.	The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.
REFERENCE BOOKS	
1.	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh,OXFORD.

ENGINEERING DRAWING

(Common for EEE, ECE & ME)

I B. Tech I Semester

Course Category	Engineering Science	**Course Code**	20ME1T02
Course Type	Theory	**L-T-P-C**	1-0-4-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce the students to use drawing instruments and to draw polygons, Engineering Curvesand Scales.
2	To introduce the students to use orthographic projections, projections of points and lines.
3	To make the students draw the projections of the planes.
4	To make the students draw the projections of the various types of solids.
5	To represent the object in 3D view through isometric views.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Construct polygons, scales and engineering curves.	K3
CO2	Identify the position of points and lines with use of orthographic projections.	K3
CO3	Analyze the location and position of plane figures through orthographicprojections.	K4
CO4	Analyze the location and position of solid bodies through orthographicprojections.	K4
CO5	Develop 2D and 3D objects by converting their views.	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	-	-	1	-	1	-
CO2	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO3	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO4	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO5	3	2	1	3	3	-	-	-	-	-	1	-	1	-

COURSE CONTENT	
UNIT I	Introduction to Engineering Drawing. **Polygons:** Constructing regular polygons by general method. **Curves:** Parabola, Ellipse and Hyperbola by general methods tangent & normal for the curves. Cycloidand Involutes. **Scales:** Vernier and Diagonal scales
UNIT II	**Orthographic Projections:** Introduction, importance of reference lines, projections of points in various quadrants. Projections of straight lines inclined to both the planes, determination of true lengths and angleof inclination
UNIT III	**Projections of planes:** Regular planes perpendicular/parallel to one plane. Regular planes inclined to oneplane and parallel to other, inclined to both the planes
UNIT IV	**Projections of Solids:** Simple positions of Prisms, Pyramids, Cones and Cylinders. Solids inclined to both the planes
UNIT V	**Isometric Projections:** Introduction, Conversion of isometric views to orthographic views, Conversionof orthographic views to isometric views. Introduction to AutoCAD (Demo only)

TEXT BOOKS	
1.	Engineering Drawing by N.D. Bhatt, Chariot Publications, 56th Edition
2.	Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age International (P) Limited (2008)
REFERENCE BOOKS	
1.	Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers, 3rd Edition
2.	Engineering Graphics for Degree by K.C. John, PHI Publishers
3.	Engineering Graphics by PI Varghese, Mc Graw Hill Publishers, 2013
4.	Engineering Drawing by Basant Agarwal, Tata McGraw Hill Publishers, 2014
5.	B.V.R. Gupta & M. Raja Roy, Engineering Drawing, I.K. International Publishing House Pvt. Ltd.,2009
WEB RESOURCES	
1.	http://nptel.ac.in/courses/112103019/
2.	http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html
3.	https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_ stu dents/engineeringdrawing.pdf

Professional Communicative English Laboratory

Common to CE, EEE, MECH, ECE, CSE, CSE (DS), CSE (AI&ML), & IT

I B. Tech I Semester

Course Category		**Course Code**	20HE1L01
Course Type		**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	
2	

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand different speech sounds and maintain proper pronunciation andrhythm in day to day conversations.	K2
CO2	Interpret and respond appropriately in various day to day contexts and improvestechnics in group discussions.	K5
CO3	Develop the required communication skills to deliver effective presentations andinterviews with clarity and impact.	K6

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1										3		3
CO2										3		3
CO3										2		

COURSE CONTENT	
UNIT I	Introduction, Consonant Sounds, Vowel Sounds
UNIT II	Rhythm and Pronunciation, Weak/strong and contrasted forms, Practice of Rhythm
UNIT III	Dialogues
UNIT IV	Group Discussion
UNIT V	Presentations & Public Speaking
UNIT VI	Interviews

TEXT BOOKS	
1.	A Multimodal Course in Communication Skills‘ Published by Maruthi Publications

APPLIED CHEMISTRY LAB
I B. Tech I Semester

Course Category	Basic sciences	**Course Code**	20BC1L02
Course Type	Lab	**L-T-P-C**	3-0-0-3
Prerequisites	Basic Chemistry	**Internal Assessment** **Semester End Examination** **Total Marks**	25 50 75

COURSE OBJECTIVES	
1	
2	

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1		
CO2		
CO3		
CO4		
CO5		

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2									
CO2	2	1		2								
CO3	2	1										
CO4												
CO5												

COURSE CONTENT
(Any 10 of the following listed 13 experiments) **LIST OF EXPERIMENTS:** Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis 1. Estimation of HCI using standard Na_2CO_3 solutions 2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH 3.Estimation of $KmnO_4$ using standard Oxalic acid solution. 4. Estimation of Ferrous iron using standard $K_2Cr_2O_7$ solution 5. Determination of Temporary and permanent Hardness of water using standard EDTA solution. 6. Determination of % moisture content in a coal sample. 7.Determination of Mg^{2+} present in an antacid *8. Estimation of HCl using standard NaOH Solution by Conductometric titration.* *9.* Estimation of Vitamin – C *10.* Preparation of Phenol – Formaldehyde Resin *11.* Determination of viscosity of a liquid *12.* Determination of surface tension of a liquid Preparation of Nano particles.(Cu/Zn)

TEXT BOOKS	
1.	Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000)
2.	N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat RaiPublishing Company (2007)
REFERENCE BOOKS	
1.	Vogel's Textbook of Quantitative chemical analysis, J. Mendham et.al
WEB RESOURCES	
1.	www.bsauniv.ac.in/UploadImages/Downloads/Estimation%20of%20Hardness
2.	https://pubs.acs.org/doi/abs/10.1021/i560133a023

Programming for Problem solving using C Lab

(Common to CE, ME, EEE, ECE, CSE, CSE (AI&ML),CSE(DS), IT)

I B. Tech I Semester

Course Category	Engineering Science	**Course Code**	20CS1L01
Course Type	Lab	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Apply the principles of C language in problem solving.
2	To design flowcharts, algorithms and knowing how to debug programs.
3	To design & develop of C programs using arrays, strings pointers & functions.
4	To review the file operations, preprocessor commands.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Knowledge on various concepts of a C language.	K3
CO2	Draw flowcharts and write algorithms.	K3
CO3	Design and development of C problem solving skills.	K3
CO4	Design and develop modular programming skills.	K3
CO5		

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	0	0	0	0	0	0	0	2	2
CO2	3	3	3	3	1	0	0	0	0	0	0	0	2	2
CO3	3	3	3	3	1	0	0	0	0	0	0	0	2	2

COURSE CONTENT	
1.	**Exercise 1:** 1. Write a C program to print a block F using hash (#), where the F has a heightof six characters and width of five and four characters. 2. Write a C program to compute the perimeter and area of a rectangle with aheight of 7 inches and width of 5 inches. 3. Write a C program to display multiple variables.
2.	**Exercise 2:** 1. Write a C program to calculate the distance between the two points. 2. Write a C program that accepts 4 integers p, q, r, s from the user where r ands are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".
3.	**Exercise 3:** 1. Write a C program to convert a string to a long integer. 2. Write a program in C which is a Menu-Driven Program to compute the area ofthe various geometrical shape. 3. Write a C program to calculate the factorial of a given number.
4.	**Exercise 4:** 1. Write a program in C to display the n terms of even natural number and their sum. 2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms. 3. Write a C program to check whether a given number is an Armstrong number or not.
5.	**Exercise 5:** 1. Write a program in C to print all unique elements in an array. 2. Write a program in C to separate odd and even integers in separate arrays. 3. Write a program in C to sort elements of array in ascending order.
6.	**Exercise 6:** 1. Write a program in C for multiplication of two square Matrices. 2. Write a program in C to find transpose of a given matrix.
7.	**Exercise 7:** 1. Write a program in C to search an element in a row wise and column wisesorted matrix. 2. Write a program in C to print individual characters of string in reverse order.
8.	**Exercise 8:** 1. Write a program in C to compare two strings without using string library functions. 2. Write a program in C to copy one string to another string.
9.	**Exercise 9:** 1. Write a C Program to Store Information Using Structures with DynamicallyMemory Allocation 2. Write a program in C to demonstrate how to handle the pointers in the program.
10.	**Exercise 10:** 1. Write a program in C to demonstrate the use of & (address of) and *(value ataddress) operator. 2. Write a program in C to add two numbers using pointers
11.	**Exercise 11:** 1. Write a program in C to add numbers using call by reference. 2. Write a program in C to find the largest element using Dynamic MemoryAllocation.

12.	**Exercise 12:** 1. Write a program in C to swap elements using call by reference. 2. Write a program in C to count the number of vowels and consonants in a stringusing a pointer.
13.	**Exercise 13:** 1. Write a program in C to show how a function returning pointer. 2. Write a C program to find sum of n elements entered by user. To perform thisprogram, allocate memory dynamically using malloc( ) function.
14.	**Exercise 14:** 1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs 2. Write a program in C to convert decimal number to binary number using the function.
15.	**Exercise 15:** 1. Write a program in C to check whether a number is a prime number ornot using the function. 2. Write a program in C to get the largest element of an array using the function.
16.	**Exercise 16:** 1. Write a program in C to append multiple lines at the end of a text file. 2. Write a program in C to copy a file in another name. 3. Write a program in C to remove a file from the disk.

Linear Algebra and Partial Differential Equations

(Common to CE, ME, ECE, CSE, IT, CSE-DS, CSE-AI&ML)

I B. Tech II Semester

Course Category	Basic Sciences	**Course Code**	20BM2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Matrices, Differentiation, Integration	**Internal AssessmentSemester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base todevelop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	solve systems of linear equations, determine the rank, find the eigenvalues andeigenvectors, diagonalization of a matrix.	K3
CO2	identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics.	K2
CO3	find areas and volumes using double and triple integrals	K2
CO4	find partial derivatives of multivariable functions and apply them to find extremevalues of a function.	K3
CO5	apply a range of techniques to find solutions of standard PDEs	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2									
CO2	3	3	2									
CO3	3	3	2									
CO4	3	3	2									
CO5	3	3	2									

COURSE CONTENT	
UNIT I	**Solving system of linear equations, Eigen Values and Eigen vectors** Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss elimination method, Gauss Jacobi and Gauss Seidel for solving system of equations – Eigenvalues and Eigen vectors and their properties.
UNIT II	**Cayley-Hamilton Theorem and Quadratic forms** Cayley-Hamilton theorem (without proof) – Finding inverse and powers of a matrix by Cayley- Hamilton theorem – Quadratic forms-Reduction to canonical form by congruent transformations-nature of the quadratic form - reduction of quadratic form to canonical form by orthogonal transformation.
UNIT III	**Multiple integrals** Multiple integrals: Double and triple integrals – Change of variables -Polar coordinates -Cylindricalcoordinates– Change of order of integration. **Applications:** Finding Areas and Volumes.
UNIT IV	**Partial differentiation** Introduction – Homogeneous function – Euler‘s theorem – Total derivative – Chain rule –Generalized Mean value theorem for single variable (without proof) – Taylor‘s and Maclaurin‘s series expansion of functions of two variables – Jacobian – Functional dependence. **Applications:** Maxima and Minima of functions of two variables without constraints andLagrange‘s method (with constraints).
UNIT V	**Partial Differential Equations and Applications** Formation of partial differential equations by elimination of arbitrary constants and arbitraryfunctions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. **Applications:** One dimensional wave and heat equations.

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O’neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6.	**T. Amarnath,** An Elementary Course in Partial Differential Equations, Narosa Publications

APPLIED PHYSICS

I B. Tech II Semester

Course Category	BASIC SCIENCES	**Course Code**	20BP2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required todesign instruments with higher resolution.
2	Impart the knowledge of Lasers, Optical Fibers and their implications in optical communications.
3	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in emerging micro devices.
4	To explain the concepts of Quantum Mechanics and free electron theories for study of metals and semiconductors.
5	Understand the formation of bands in Semiconductors and their working mechanism for their utility in Engineering applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the optical applications using the concepts of Interference and diffraction.	K4
CO2	Apply the basics of Laser Mechanism and fiber optics for the communications systems.	K3
CO3	Apply the basics of phenomenon related to dielectric materials and MagneticMaterials to study their dependence on temperature and frequency response.	K43
CO4	Understand the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles.	K2
CO5	Understand the Band formation, electrical conductivities in semiconductorsand study the types of semiconductors using Hall Effect.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT	
UNIT I	**WAVE OPTICS** **(10 hrs) INTERFERENCE** Introduction-Principle of Superposition – Coherent Sources – Interference in parallel thin film(reflection geometry)- Newton‘s rings, Determination of Wavelength and Refractive Index & Applications. **DIFFRACTION** Introduction-Types of diffraction-Fraunhoffer diffraction due to single slit, Double slit, N Slits (Qualitative)-Rayleigh criterion of resolution and Resolving power of grating(Qualitative).
UNIT II	**LASERS (8hrs)** Introduction-Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Pumping Schemes - Ruby laser – Helium Neon laser – Applications **FIBER OPTICS:** Introduction- Structure & Principle of Optical Fiber-Numerical Aperture and Acceptance Angle-classification of Optical fibers based on Refractive Index Profile and Modes- Block Diagram of optical fiber communication system- Advantages of Optical fibers- Applications
UNIT III	**MAGNETICS PROPERTIES (12 hrs)** Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials Dia,Para,Ferro,Antiiferro and Ferri Magnetic materials-Weiss Domain Theory(Qualitative Treatment)-Hysteresis-B-H Curve-soft and hard magnetic materials & applications **DIELECTRICS** Introduction - Dielectric polarization– Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations- Electronic Ionic and Orientation polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation -Applications of dielectrics.
UNIT IV	**QUANTUM MECHANICS (9hrs)** Introduction – Matter waves – de Broglie‘s hypothesis–Interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potentialbox **FREE ELECTRON THEORY** Classical Free Electron Theory(Qualitative with discussions of merit and demerits)-Quantum Free Electron Theory-Equation of conductivity based on quantum free electron theory-FermiDirac Distribution-Density of States-Fermi Energy
UNIT V	**BAND THEORY OF SOLIDS (9hrs)** Bloch‘s Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron-Classification of Crystalline Solids-Concept of hole **SEMICONDUCTOR PHYSICS** Introduction–Intrinsic Semi conductors - density of charge carriers- Electrical

	conductivity –Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers- Drift and Diffusion currents-Einstein's Equation -Hall effect - Applications of Hall effect

TEXT BOOKS	
1.	Engineering Physics by M.N.Avadhanalu,P.G.Kshirsagar & T V S Arun Murty,S ChandPubication,11th Edition 2019
2.	–Engineering Physics‖ by M.R.Srinivasan, New Age international publishers
3.	Engineering Physics by P.K Palanisamy,Sci Tech Publication
REFERENCE BOOKS	
1.	Kettles Introduction to Solid state Physics-Charles Kittel,Wiley India Edition
2.	Solid State Physics ,AJ Dekker, I Edition,Macmillan Publishers India Private Limited
3.	–Solid State Physics‖ by SO Pilai., - New age International Publishers
4.	Engineering Physics by DK Bhattacharya and Poonam Tandon,Oxford Press(2018)
5.	
WEB RESOURCES	
1.	https://nptel.ac.in/courses/122/107/122107035/# https://nptel.ac.in/courses/122/107/122107035/#
2.	https://pragatiengg.org/pluginfile.php/29143/mod_folder/content/0/UNIT%20IV%20LASERS%20.p ptx?forcedownload=1 https://nptel.ac.in/courses/104/104/104104085/ https://nptel.ac.in/courses/115/107/115107095/
3.	https://nptel.ac.in/courses/113/104/113104090/ https://youtu.be/DDLljK1ODeg
4.	https://study.com/academy/lesson/the-de-broglie-hypothesis-definition-significance.html https://nptel.ac.in/courses/115/101/115101107/ https://nptel.ac.in/courses/115/105/115105122/
5.	https://www.electronics-tutorials.ws/diode/diode_1.html https://nptel.ac.in/courses/115/105/115105099/ https://nptel.ac.in/courses/108/108/108108122/

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(ECE)
I B. Tech II Semester

Course Category	Professional Core	**Course Code**	20CS2T04
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	C,C++	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	the analytical skills of object oriented programming
2	Overall development of problem solving and critical analysis.
3	Formal introduction to Java programming language.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply decision and iteration control structures to implement algorithms andclasses from the specifications.	K3
CO2	Implement inheritance and packages	K3
CO3	Demonstrate an introductory understanding of graphical user interfaces,multithreaded programming, and event-driven programming.	K1
CO4	Implement I/O programming	K3
CO5	Implementing multi Multithreading and exception handling in java	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3										2	1
CO2	3	3	3										1	1
CO3	3	3	2										1	1
CO4	3	3	2										1	1
CO5	3	3	2										1	1

COURSE CONTENT	
UNIT I	Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java. Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.
UNIT II	Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.
UNIT III	Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Creating a swing applet, swing controls and components.
UNIT IV	I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Event driven model, handling events
UNIT V	Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

TEXT BOOKS	
1.	Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson
2.	Programming in Java, Sachin Malhotra& Saurabh Chaudhary, Oxford University Press..
REFERENCE BOOKS	
1.	Murach‘s Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman,SPD.
2.	Core Java Volume-I Fundamentals, Eight Edition, Horstmann& Cornell, Pearson Education.
3.	The Complete Reference, Java 2 (Fourth Edition), Herbert Schild,TMH. Java Programming, D. S. Malik, Cengage Learning.
WEB RESOURCES	
1.	https://www.tutorialspoint.com/java/java_object_classes.
2.	http://beginnersbook.com/2015/07/java-swing-tutorial/
3.	http://www.realapplets.com/tutorial/
4.	https://www.youtube.com/watch?v=aUlwgdakBug
5.	http://beginnersbook.com/2013/04/java-exception-handling/ and words in a text file.

NETWORK ANALYSIS

(ECE)

I B. Tech II Semester

Course Category		**Course Code**	20EC2T01
Course Type		**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To understand the basic concepts on RLC circuits
2	To know the behavior of the steady states and transients‘ states in RLC circuits
3	To know the basic Laplace transforms techniques in periods‘ waveforms
4	To understand the two port network parameters
5	To understand the properties of LC networks and filters

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Gain the knowledge on basic network elements.	
CO2	Analyze the RLC circuits behavior in detailed	
CO3	Analyze the performance of periodic waveforms.	
CO4	Gain knowledge in characteristics of two port network parameters (Z, Y, ABCD, h, g).	
CO5	Analyze the filter design concepts in real world applications.	

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	2	-	-	-	-	-	-	-	-	1	1
CO2	3	2	2	2	-	-	-	-	-	-	-	-	2	2
CO3	2	2	2	2	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	1	-	-	-	-	-	-	-	-	2	2
CO5	3	1	2	2	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT I	Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff‘s laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources. Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation withrelevant theory, problem solving. Principal of Duality with examples. Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule
UNIT II	Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DCexcitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method
UNIT III	Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R- L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-LC problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving
UNIT IV	Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti-resonance, Bandwidth of parallel resonance, general case-resistance present in both branches, anti- resonance at all frequencies Network Theorems: Thevinin‘s, Norton‘s, Milliman‘s, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also
UNIT V	Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission lineparameters, Relationship between parameter sets, Parallel connection of two port networks, cascading of two port networks, series connection of two port networks, problem solving including dependent sources also

TEXT BOOKS	
1.	Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition,2000
2.	Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3.	Electric Circuit Analysis by Hayt and Kimmarle, TMH
REFERENCE BOOKS	
1.	Network lines and Fields by John. D. Ryder 2ndedition, Asia publishing house.
2.	Basic Circuit Analysis by DR Cunninghan, Jaico Publishers
3.	Network Analysis and Filter Design by Chadha, Umesh Publications

Basic Electrical Engineering

(ECE)

I B. Tech II Semester

Course Category	Engineering Sciences	**Course Code**	20EE2T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NA	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn the constructional details, operating principle and performance of transformers.
2	To understand the constructional details, operating principle and operational characteristics of Induction machines.
3	To study the constructional details, operating principle of single phase induction motors and synchronousGenerators
4	To learn the operating principle and starting methods of synchronous motors.
5	To understand the operating principle, characteristics of DC machines and speed control methods of DCMotors.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the constructional details, operating principle andperformance of transformers.	K2
CO2	Explain the constructional details, operating principle and operational characteristics of Induction machines.	K2
CO3	Explain the constructional details, operating principle of single phase induction motors and synchronous generators.	K2
CO4	Explain the operating principle and starting methods of synchronous motors.	K2
CO5	Understand the operating principle, characteristics of DC machinesand speed control methods of DC Motors.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	2										
CO4	3	2	1	1										
CO5	3	2	1	1										

COURSE CONTENT	
UNIT I	**Transformers** Constructional details, operating principle – EMF equation- equivalent circuit – Losses,efficiency and voltage regulation – direct load test, OC & SC tests.
UNIT II	**Induction Machines** Constructional details, operating principle - types – torque-slip characteristics-efficiencystarting methods-Brake test on 3-phase induction motor.
UNIT III	**Single Phase Induction Motor** Constructional details, operating principle - starting methods - shaded pole motor, capacitorstart and run motors. **Synchronous Generators** Constructional details, operating principle – types - EMF equation – phasor diagram -voltageRegulation by synchronous impedance method.
UNIT IV	**Synchronous motors** Constructional details, operating principle – starting methods. excitation and power factorcontrol Phasor diagrams
UNIT V	**DC Machines** Constructional details, operating principle – types – EMF and torque equations – three pointstarter – speed control methods of DC motor – Swinburne_s Test-applications.

TEXT BOOKS	
1.	Electric Machinery by A. E. Fitzgerald, Charles Kingsley, Jr. and Stephen D.Umans McGraw-HillHigher Education,6thEdition.
2.	Principles of electric machines by V.K.Mehta& Rohit Mehta, S.Chand publications
3.	Theory and performance of Electrical machines by J.B.Gupta, S.K.Kataria& Sons.
REFERENCE BOOKS	
1.	Basic Electrical Engineering by M.S Naidu and S. Kamakshiah TMH Publications.
2.	Fundamentals of Electrical engineering by Rajendra Prasad, PHI publications, 2nd Edition.
3.	Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd Edition.
4.	Basic Electrical Engineering by D C Kulshreshtha McGraw-Hill Education, revised 1st Edition.
5.	Electrical Technology by B L Theraja&A.K.Theraja, S.Chand publications ,Volume 2
WEB RESOURCES	
1.	www.nptel.ac.in/courses/108108076/
2.	https://nptel.ac.in/courses/122106025/

ELECTRONIC WORKSHOP LAB(ECE)

I Year II Semester

Course Category		**Course Code**	20EC2L01
Course Type		**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	learn the identification of components and laboratory equipment
2	practice the soldering, PCB layout and testing of components
3	obtain the frequency response of RL, RC circuits and determining network parameters
4	verify network theorems like superposition, reciprocity, maximum power transfer, Thevenin‘s and Norton‘s

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand component identification and usage of laboratory equipment.	
CO2	Practice the soldering, PCB layout and testing of components.	
CO3	Analyze frequency response of RL, RC circuits and network parameters.	
CO4	Verification of network theorems like superposition, reciprocity, maximum power transfer, Thevenin‘s and Norton‘s.	

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2		1								1	2
CO2	2	2	1		2								2	1
CO3	1	1	2		2								1	2
CO4	2	1	2		1								1	1
CO5	2	2	2		1								1	2

COURSE CONTENT

Cycle-1 (Workshop):

I. Identification of components
II. Laboratory equipment
III. Soldering practice
IV. PCB Layout
V. Testing of Components
VI. CRO

I. Identification of components:

- Resistors: - Types of Resistors, Value of Resistance using color code, DRBS.
- Capacitors: - Types of capacitors, value of capacitance using color code, DCBS.
- Inductors: - Types of Inductors, DLB
- Rheostats: - Types of Rheostats, Types of potentiometers, Relays.
- Switches: - Types of Switches.
- Cables: Types of Cables.
- Types of Instruments used. Identification of active elements. (Two Terminal, ThreeTerminal Devices) (SC diode, Zener diode, D.AC)
- Three Terminal Devices: BJT, UJT, SCR, FET, MOSFET, TRIAC.
- Digital and Analog ICs. (TO and Flat packages) IC regulators types.
  Testing of above components using Multimeter

II. Laboratory Equipment:

A) Meters: -

Types of Voltmeters, Types of Ammeters both Analog and Digital.Types of Multi meters (Analog &Digital) AVO Meters and FET input Voltmeter.

B) Laboratory Function Generators and Audio Oscillators.
C) Power Supplies.
D) RF generators.
E) Different Types of Transformers. (Power, AF, RF, etc.)

III. Soldering practice
IV. PCB layout and Design - Materials required, centimeter graph sheets, marker.
V. Testing of Components - Active and Passive Components.
VI. CRO - Acquaintance with CRO and Measurements on CRO

PART-B (Networks Lab)

1. Series and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factordetermination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – timeconstant and steady state error determination.
3. Determination of Two port network parameters – Z-Y Parameters, chain matrix andanalytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on ACwith Resistive and Reactive loads.
6. Experimental determination of Thevenin‘s and Norton‘s equivalent circuits and verificationby direct test.

Basic Electrical Engineering Lab

(ECE)

I B. Tech II Semester

Course Category	Engineering Sciences	**Course Code**	20EE2L03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NA	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn the constructional details, operating principle and performance of transformers.
2	To understand the constructional details, operating principle and operational characteristics of Induction machines.
3	To study the constructional details, operating principle of single phase induction motors and synchronous generators
4	To learn the operating principle and starting methods of synchronous motors.
5	To understand the operating principle, characteristics of DC machines and speed control methods of DC Motors.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the constructional details, operating principle andperformance of transformers.	K2
CO2	Explain the constructional details, operating principle and operational characteristics of Induction machines.	K2
CO3	Explain the constructional details, operating principle of single phase induction motors and synchronous generators.	K2
CO4	Explain the operating principle and starting methods of synchronous motors.	K2
CO5	Understand the operating principle, characteristics of DC machinesand speed control methods of DC Motors.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1										
CO2	3	2	1	1										
CO3	3	2	1	2										
CO4	3	2	1	1										
CO5	3	2	1	1										

COURSE CONTENT	
UNIT I	**Transformers** Constructional details, operating principle – EMF equation- equivalent circuit – Losses,efficiency and voltage regulation – direct load test, OC & SC tests.
UNIT II	**Induction Machines** Constructional details, operating principle - types – torque-slip characteristics-efficiencystarting methods-Brake test on 3-phase induction motor.
UNIT III	**Single Phase Induction Motor** Constructional details, operating principle - starting methods - shaded pole motor, capacitorstart and run motors. **Synchronous Generators** Constructional details, operating principle – types - EMF equation – phasor diagram -voltageregulation by synchronous impedance method.
UNIT IV	**Synchronous motors** Constructional details, operating principle – starting methods. excitation and power factorcontrol Phasor diagrams
UNIT V	**DC Machines** Constructional details, operating principle – types – EMF and torque equations – three pointstarter – speed control methods of DC motor – Swinburne_s Test-applications.

TEXT BOOKS	
1.	Electric Machinery by A. E. Fitzgerald, Charles Kingsley, Jr. and Stephen D.Umans McGraw-Hill Higher Education,6thEdition.
2.	Principles of electric machines by V.K.Mehta& Rohit Mehta, S.Chand publications
3.	Theory and performance of Electrical machines by J.B.Gupta, S.K.Kataria& Sons.
REFERENCE BOOKS	
1.	Basic Electrical Engineering by M.S Naidu and S. Kamakshiah TMH Publications.
2.	Fundamentals of Electrical engineering by Rajendra Prasad, PHI publications, 2nd Edition.
3.	Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd Edition.
4.	Basic Electrical Engineering by D C Kulshreshtha McGraw-Hill Education, revised 1st Edition.
5.	Electrical Technology by B L Theraja&A.K.Theraja, S.Chand publications ,Volume 2
WEB RESOURCES	
1.	www.nptel.ac.in/courses/108108076/
2.	https://nptel.ac.in/courses/122106025/

APPLIED PHYSICS LABORATORY
I-II EEE,ECE,CSE(DS),CSE(AI & ML
I B. Tech II Semester

Course Category	BASIC SCIENCES	**Course Code**	20BP2L02
Course Type	Lab	**L-T-P-C**	3-0-0-3
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	
2	

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Interference, Diffraction in Physics using instruments likeSpectrometer, Travelling microscope.	K2
CO2	Determine the Magnetic and Dielectric constants of materials.	K3
CO3	Apply the basics of Current Electricity and Semiconductors in engineeringapplication	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-											
CO2	2	-	-											
CO3	2	2	2											

COURSE CONTENT: (Any 10 of the following listed 15 experiments): **8 Regular mode and any two experiments in Virtual mode(Virtual Lab)**	
1.	Determination of wavelength of laser Light using diffraction grating.
2.	Determination of wavelength of a light using Diffraction Grating-Normal incidence.
3.	Newton‘s rings – Determination of Radius of Curvature of Plano - Convex Lens.
4.	Determination of thickness of a spacer using wedge film and parallel interference fringes.
5.	Magnetic field along the axis of a current carrying coil – Stewart and Gee‘s apparatus.
6.	Energy Band gap of a Semiconductor p - n junction.
7.	Characteristics of Thermistor – Temperature Coefficients
8.	Determination of dielectric constant by charging and discharging method
9.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10.	Determination of Dispersive power of diffraction grating.
11.	To Study the V-I Characteristics and determine the breakdown voltage of a Zener Diode
12.	Determination of Hall Voltage and Hall coefficients of a given semiconductor using Hall effect.
13.	Determination of Acceleration due to gravity and Radius of gyration Using Compound Pendulum.
14.	Determination of Numerical Aperture and acceptance angle of an Optical Fiber
15.	Estimation of Planck‘s Constant using Photoelectric Effect.

Environmental Sciences

(Common to CE, ME, ECE, CSE, CSEDS&AI, IT)

I B. Tech II Semester

Course Category	Basic Sciences	**Course Code**	20BE2T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basic Knowledge in Environment and protection.	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	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 theinventions by the engineers.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Gain a higher level of personal involvement and interest in understanding and solvingenvironmental problems.	
CO2	Comprehend environmental problems from multiple perspectives with emphasis onhuman modern lifestyles and developmental activities	
CO3	Demonstrate knowledge relating to the biological systems involved in the major globalenvironmental problems of the 21st century	
CO4	Recognize the interconnectedness of human dependence on the earth‘s ecosystems	
CO5	Influence their society in proper utilization of goods and services.	
CO6	Learn the management of environmental hazards and to mitigate disasters and have aclear understanding of environmental concerns and follow sustainable development practices	

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	1	0	0	1	2	0	0	0	1	0	0	0
CO2	0	1	0	0	0	0	1	0	0	0	0	0	0	0
CO3	0	0	0	0	2	0	1	0	0	0	0	0	0	0
CO4	0	0	0	0	1	1	3	0	0	0	0	0	0	0
CO5	0	0	0	0	0	0	3	1	0	0	0	0	0	0

UNIT – I	**Multidisciplinary nature of Environmental Studies** Definition, Scope and Importance-*International Efforts & Indian Environmentalists* **Natural Resources** Forest resources : deforestation – Mining, dams and other effects on forest and tribal people.Water resources :Use and over utilization of surface and groundwater. Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems.Energy resources: renewable and nonrenewable energy sources. Role of an individual in conservation of natural resources.Equitable use of resources for sustainablelifestyles. **LEARNING OUTCOMES:** **Students will be able to** Articulate the basic structure, functions, and processes of key social systems affecting the environmentExplain why renewable and non-renewable energy resources are important. Explain how water resources should be used.
UNIT- II	**Ecosystems, Biodiversity and its conservation** Definition of Ecosystem and its structure, Functions Biodiversity Definition-Value of biodiversity, Indiaas a mega-diversity nation, Threats to biodiversity, Conservation of biodiversity, *Endangered and endemic species of India*. **LEARNING OUTCOMES:** **Students will be able to** Get a clear picture of structure and functions of ecosystems. Demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematic inthe broad sense. Explain endangered and endemic species of India
UNIT- III	**Environmental Pollution and Solid Waste Management** Definition, Cause, Effects of Air pollution, Water pollution, Noise pollution, Radioactive pollution, Roleof an individual in prevention of pollution. Solid Waste Management: Sources, effects and control measures of urban and industrial waste, *e-waste management* **LEARNING OUTCOMES** **Students will be able to** Understand Cause, effects and control measures of air pollution.Understand solid waste management
UNIT IV	**Social Issues and the Environment** Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act-Issuesinvolved in enforcement of environmental legislation, Rain water harvesting, Global Environmental challenges-*case studies* **LEARNING OUTCOMES:** **Students will be able to** Explain the enforcement of Environmental legislations Acquire knowledge on various environmental challenges induced due to unplanned anthropogenicactivities.

	Explain the reasons for global warming
UNIT-V	**Human population and the Environment** Population growth, Women and child welfare, Role of Information technology in environment andhuman health. *Impact Assessment and its significances, stages of EIA* Field work: A mini project related to Environmental issues / to visit a local polluted site (Submission of project byevery student) **LEARNING OUTCOMES** **Students will have** Explain various types of information technologies Explain the theories of population explosion Acquire knowledge on various environmental challenges induced due to unplanned anthropogenicactivities

TEXT BOOKS	
1.	Environmental Studies for undergraduate courses by ErachBharucha,UGC.
2.	A Textbook of Environmental Studies by Dr.S.AzeemUnnisa,Acadamicpublishing company.
3.	Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K.Manjula Rani; Pearson Education, Chennai
REFERENCE BOOKS	
1.	Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar,Cengage learning.
2.	Glimpses of Environment by K.V.S.G. Murali Krishna Published byEnvironmental Protection Society, Kakinada, A.P.
3.	Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh: AcmeLearning, New Delhi.
5.	An Introduction to Environmental Pollution by Dr.B.k.Sharma AND Dr.(Miss)H.kaur,Goel publishing House ,a unit of Krishna Prakasham Media (p)LH,Meerut –India
WEB RESOURCES	
1.	**UNIT-1: MULTI DISPLINARY NATURE OF ENVIRONMENT and NATURAL RESOURCES** http://www.defra.gov.uk/environment/climatechange https://www.climatesolutions.org https://en.wikibooks.org/wiki/Ecology/Ecosystems
2.	**UNIT-2:ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION** http://conbio.net/vl/ and www.biodiversitya-z.org/content/biodiversity
3.	**UNIT-3: ENVIRONMENTAL POLLUTION** https://www.omicsonline.org/environment-pollution-climate-change.php and https://www.britannica.com/technology/solid-waste-management
4.	**UNIT-4: SOCIAL ISSUES AND THE ENVIRONMENT** http://www.publichealthnotes.com/solid-waste-management/
5.	**UNIT-5: HUMANPOPULATION AND THE NVIRONMENT**http://www.ecoindia.com/education/water-conservation.html https://thewaterproject.org/water_conservation\ https://legalcareerpath.com/what-is-environmental-law/

Transforms and Vector Calculus

(ECE)

II B. Tech I Semester

Course Category	Basic Science	**Course Code**	20BM3T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment Semester** **End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES
1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

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COURSE OUTCOMES		
Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	examine the properties of Laplace transformation	K3
CO2	solve ordinary differential equations by using Laplace transformation technique	K2
CO3	expand a periodic function as a Fourier series and find Fourier transform of a given function.	K3
CO4	understand vector differential properties of scalar and vector point functions and their applications.	K2
CO5	apply Green‘s, Stokes and Divergence theorem to evaluate line, surface and volume integrals.	K3

K1: Remember,K2: Understand,K3: Apply,K4: Analyze,K5: Evaluate,K6: Create

Contribution of Course Outcomes towards achievement of Program Outcomes(1–Low, 2–Medium, 3 –High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	1
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	1
CO3	3	3	2	-	-	-	-	-	-	-	-	-	3	1
CO4	3	3	2	-	-	-	-	-	-	-	-	-	3	1
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	1

COURSECONTENT	
UNIT I	**Laplace transforms:** Laplace transforms of standard functions – Properties - Periodic functions - Unit step function – Dirac‘s delta function.
UNIT II	**Inverse Laplace transforms:** Inverse Laplace transforms – Properties – Convolution theorem (without proof). **Applications:** Solving ordinary differential equations (initial value problems) using Laplace transforms.
UNIT III	**Fourier Analysis:** Introduction- Periodic functions – Dirichlet‘s conditions - Fourier series of a function, even and odd functions –Change of interval – Half-range sine and cosine series. Fourier integral theorem (without proof) – Fourier sine and cosine integrals – sine and cosine transforms – Inverse transforms.
UNIT IV	**Vector Differentiation:** Gradient - Directional derivative - Divergence – Curl – Laplacian and second order operators – Vector identities.
UNIT V	**Vector Integration:** Line integral – Work done – Potential function – Area, Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

Text Book	
1	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
Reference Book	
1	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3	**Peter O’neil**, Advanced Engineering Mathematics, Cengage Learning.
4	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6	**Murray R Speigel,** Schaum's Outline of Vector Analysis, Schaum‘s Outline.
7	**Shanti Narayan**, Integral Calculus – Vol. 1 & II

Signals and Systems
(ECE)
II B. Tech I Semester

Course Category	Professional Core	**Course Code**	**20EC3T04**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Linear Algebra	**Internal Assessment Semester** **End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES

1. To study the changes that occur to the signal as they pass through systems.
2. To predict with some certainty the behavior of the system when subjected to the different input signals.
3. To provide the overview of the concept, the theory, and the mathematical tools in the applications in diversified fields such as Digital Signal Processing, Image processing, Modulation & Detection, etc.

COURSE OUTCOMES

Up on successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	classify signals, systems and understanding the difference between discrete and continuous time signals, systems and ability to determine the response of linear systems to any input signal by convolution in the time domain.	L2
CO2	Understand the definitions and basic properties (time-shift, modulation, Parseval's Theorem) of Fourier series and the application of the LTI system as a frequency selective filter.	L4
CO3	Understand represent aperiodic signal (discrete & continuous) as linear combination of complex exponential and basic properties of Fourier Transform and representation of continuous and discrete system by differential & difference equation.	L2
CO4	apply the Sampling theorem, reconstruction, aliasing, and Nyquist's theorem to represent continuous-time signals in discrete time and to understand generalize Continuous-Time Fourier transform known as Laplace Transform, its properties.	L3
CO5	Approach Discrete-Time to develop z-Transform, which is the counterpart of Laplace transform for Continuous-Time.	L3

L1: Remember,L2: Understand,L3: Apply,L4: Analyze,L5: Evaluate,L6: Create

Contribution of Course Outcomes towards achievement of Program Outcomes(1–Low, 2–Medium, 3 –High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS0O1**	**PSO2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	1
CO5	3	2	-	-	-	-	-	-	-	-	-	-	3	1

COURSECONTENT	
UNIT I	**Signals & Systems-**Continuous-Time & Discrete-Time Signals, Signal Energy and Power, Transformation of independent variable (Continuous to discrete, scaling, sifting), Periodic Signals, Even & Odd Signals, Exponential & Sinusoidal Signals (Continuous & Discrete), The Unit Impulse & Unit –Step Functions (Continuous & Discrete), Continuous-Time & Discrete-Time Systems, Properties. Classification of Systems with examples (LTV, LTI, NLTV and NLTI). **Linear Time-Invariant System-**Discrete-Time LTI Systems, Continuous-Time LTI Systems, Properties of LTI Systems, Causal LTI system Described by Differential & Difference equations, Singularity function, Defining Unit Impulse function through Convolution.
UNIT II	**Fourier Series-**Fourier Series Representation of Continuous-Time Periodic Signal, Dirichlet‘s Conditions, Properties of Continuous-Time Fourier Series. Fourier Series Representation of Discrete-Time Periodic Signal, Properties of Discrete -Time Fourier Series. Frequency selective Filters, Discrete-Time Filters Described by Difference Equation.
UNIT III	**Fourier Transform-**Development of the Fourier Transform Representation of an Aperiodic Signal (Only Concept, No Derivation), Properties of Continuous-Time Fourier Transform, Frequency-Selective Filtering with Variable Centre Frequency, System Characterized by Linear Constant Coefficient Differential Equations. Discrete-Time Fourier Transform of an Aperiodic Signals (No Derivation), Properties of Discrete-Time Fourier Transform, Duality Between the Discrete-Time Fourier Transform and Continuous-Time Fourier Series, System Characterized by Linear Constant-Coefficient Difference Equation.
UNIT IV	**Sampling-**Impulse-Train Sampling, Sampling with a Zero-Order Hold, Reconstruction of a Signal from its Samples Using Interpolation, The Effect of Under sampling: Aliasing. **The Laplace Transform-**The Laplace Transform, The Region of Convergence (ROC) for Laplace Transform, The Inverse Laplace Transform, Properties of Laplace Transform, Causality & Stability of a continuous LTI System, Relation Between Laplace & Fourier Transform.
UNIT V	**The Z-Transform-**The z-Transform, The Region of Convergence of z-Transform, The Inverse z-Transform, Properties of z-Transform, Causality & Stability of a Discrete LTI System. LTI System Characterized by Linear Constant Coefficient Difference Equation.

Text Book	
1	Signals and Systems – A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edition.
2	B.P. Lathi - Principles of Linear Systems and Signals (2009, Oxford University Press)
Reference Book	
1	Signals, Systems&Communications-B.P.Lathi,BSPublications,2003.
2	TK Rawat- Signals and Systems, Oxford University press, 2011.
3	Simon Haykin and VanVeen- Signals & Systems, Wiley,2ndEdition

Electronic Devices and Circuits
(ECE)
II B. Tech I Semester

Course Category	Professional Core	**Course Code**	**20EC3T05**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Engineering Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	learn and understand the basic concepts of semiconductor physics and study the physical phenomena of PN junction diode.
2	understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
3	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
4	learn and understand the purpose of transistor biasing and its significance.
5	understand the small signal low frequency BJT and FET transistor amplifiers models and compare different configurations.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the basic concepts of semiconductor physics and understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation	K2
CO2	Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.	K2
CO3	Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.	K2
CO4	Apply the concepts of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.	K3
CO5	Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2										2	2
CO2	3	3	2		1								2	2
CO3	3	3		1									2	2
CO4	3	3	2		1						2		2	2
CO5	**3**	3	2	2								2	2	2

COURSE CONTENT

UNIT-I	**Review of Semiconductor Physics:** Insulators, Semiconductors, and Metals, classification usingenergy band diagrams, mobility and conductivity, electrons and holes in intrinsicsemiconductors, extrinsic semiconductors, drift and diffusion, charge densities insemiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function,Fermi level in intrinsic and extrinsic Semiconductors **Junction Diode Characteristics:** energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.
UNIT-II	**Special Semiconductor Devices**: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics. **Rectifiers and Filters:** Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π- Filter, comparison of various filter circuits in terms of ripple factors
UNIT-III	**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values. **FET:** FET types, construction, operation, characteristics μ, gm, rd parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.
UNIT-IV	**Transistor Biasing and Thermal Stabilization:** Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability. FET Biasing-methods and stabilization.
UNIT-V	**Small Signal Low Frequency Transistor Amplifier Models:** **BJT:** Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. **FET:** Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS	
1.	Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, 2nd Edition,2007
2.	Electronics Devices &Circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, 10th Edition, 2009
REFERENCE BOOKS	
1.	Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, 2nd Edition,2009
2.	Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications
3.	Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4th Edition, 2008.

Switching Theory and Logic Design

(ECE)

II B. Tech I Semester

Course Category	Professional Core	**Course Code**	**20EC3T06**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Electronics and Logic Gates	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	typical number base conversion, error coding techniques, Theorems and functions of Boolean algebra and behavior of logic gates.
2	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
3	the concepts of combinational circuits
4	the concepts of sequential circuits
5	The development of advanced sequential circuits.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Classify different number systems and apply to generate various codes.	K2
CO2	Use the concept of Boolean algebra in minimization of switching functions.	K2
CO3	Design different types of combinational logic circuits.	K4
CO4	Apply the knowledge of flip-flops in designing of Registers and counters	K3
CO5	The operation and design methodology for synchronous sequential circuits and algorithmic state machines.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1									2	2
CO2	2	3	2	1									2	2
CO3	2	2	3	2									2	2
CO4	2	2	3	2									2	2
CO5	2	2	3	2									2	2

COURSE CONTENT	
UNIT-I	**REVIEW OF NUMBER SYSTEMS & CODES:** Representation of numbers of different radix, conversation from one radix to another radix, r-1‘s compliments and r‘s compliments of signed members. Gray code ,4-bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code. **BOOLEAN THEOREMS AND LOGIC OPERATIONS:** Boolean theorems, principle of complementation & duality, De-Morgan‘s theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.
UNIT-II	**MINIMIZATION TECHNIQUES:** Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-McCluskey method) with only four variables and single function. COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.
UNIT-III	**COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI**: Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoders. Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154. **INTRODUCTION OF PLD’s:** PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.
UNIT-IV	**SEQUENTIAL CIRCUITS I:** Classification of sequential circuits (synchronous and asynchronous), operation of NAND & NOR latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register. Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.
UNIT-V	**SEQUENTIAL CIRCUITS II:** Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS	
1.	Switching and finite automata theory ZviKOHAVI,Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2.	Digital Design by M. Morris Mano, Michael D Ciletti,4th edition, PHIpublication,2008
REFERENCE BOOKS	
1.	Fundamentals of Logic Design by Charles H. Roth Jr,JaicoPublishers,2006
2.	Digital Design: Principles and Practices,John.F. Wakerly,4 thedition,Pearson Education
3.	Switching Theory and Logic Design by A. Anand Kumar,PHI Learning pvtltd,2016.

Data Structures

(ECE)

II B. Tech I Semester

Course Category	Engineering Science	**Course Code**	20IT3T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	Introduce the fundamental concept of data structures and abstract data types
2	Emphasize the importance of data structures in developing and implementing efficientalgorithms
3	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs arerepresented in memory and used by algorithms

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Summarize the properties, interfaces, and behaviors of basic abstract datatypes	K2
CO2	Discuss the computational efficiency of the principal algorithms for sorting &searching	K2
CO3	Use arrays, records, linked structures, stacks, queues, trees, andGraphs in writing programs	K3
CO4	Demonstrate different methods for traversing trees	K2
CO5	Implement algorithms on Graphs	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium,3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	1	1	-	-	-	-	-	-	2	1
CO2	2	3	1	1	1	-	-	-	-	-	-	-	1	1
CO3	2	3	1	2	1	-	-	-	-	-	-	-	1	1
CO4	2	3	1	1	1	-	-	-	-	-	-	-	1	1
CO5	3	3	1	1	1	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT-I	Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity. Searching - Linear search, Binary search, Fibonacci search. Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.
UNIT-II	Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list-PolynomialExpression Representation,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.
UNIT-III	Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues, Circular Queues, Deques, Priority Queues, Multiple Queues. Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.
UNIT-IV	Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.
UNIT-V	Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra‘s shortest path, Transitive closure, Warshall‘s Algorithm.

TEXT BOOKS	
1.	Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
2.	Data Structures and algorithm analysis in C, 2nd ed, Mark Allen Weiss.
REFERENCE BOOKS	
1.	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2.	Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon,Cengage.
3.	Data Structures with C, Seymour Lipschutz TMH
WEB RESOURCES	
1.	http://algs4.cs.princeton.edu/home/
2.	https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

Java Programming Laboratory

(ECE)

Course Category	ESC	**Course Code**	20CS3L12
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination**	15 35
		Total Marks	50

COURSE OBJECTIVES	
1	Practice programming in the Java
2	Gain knowledge of object-oriented paradigm in the Java programming language
3	Learn use of Java in a variety of technologies and on different platforms

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Evaluate default value of all primitive data type,	K3
CO2	Determine Class, Objects, Methods, Inheritance, Exception,	K3
CO3	Illustrating simple inheritance, multi-level inheritance,	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**10**	**PSO1**	**PSO2**
CO1	3	3	3	2	0	0	0	0	0	0	0	0	3	2
CO2	3	3	3	2	0	0	0	0	0	0	0	0	3	2
CO3	3	3	3	2	0	0	0	0	0	0	0	0	3	2

COURSE CONTENT	
1	**Exercise - 1** (Basics) a) Write a JAVA program to display default value of all primitive data type of JAVA b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate thediscriminate D and basing on value of D, describe the nature of root. c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed ofall 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.
2	**Exercise - 2** (Operations, Expressions, Control-flow, Strings) a) Write a JAVA program to search for an element in a given list of elements using binary searchmechanism. b) Write a JAVA program to sort for an element in a given list of elements using bubble sort c) Write a JAVA program to sort for an element in a given list of elements using merge sort. d) Write a JAVA program using StringBuffer to delete, remove character.
3	**Exercise - 3** (Class, Objects) a) Write a JAVA program to implement class mechanism. Create a class, methods and invokethem inside main method. b) Write a JAVA program to implement constructor.
4	**Exercise - 4** (Methods) a) Write a JAVA program to implement constructor overloading. b) Write a JAVA programimplement method overloading.
5	**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
6	**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?
7	**Exercise - 7** (Exception) a) Write a JAVA program that describes exception handling mechanism b) Write a JAVA program Illustrating Multiple catch clauses
8	**Exercise – 8 (**Runtime Polymorphism) a) Write a JAVA program that implements Runtime polymorphism b) Write a Case study on run time polymorphism, inheritance that implements in above problem
9	**Exercise – 9** (User defined Exception) a) Write a JAVA program for creation of Illustrating throw b) Write a JAVA program for creation of Illustrating finally c) Write a JAVA program for creation of Java Built-in Exceptions d) Write a JAVA program for creation of User Defined Exception

10	**Exercise – 10** (Threads) 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 program illustrating **isAlive** and **join ()** c) Write a Program illustrating Daemon Threads.
11	**Exercise - 11** (Threads continuity) a) Write a JAVA program Producer Consumer Problem b) Write a case study on thread Synchronization after solving the above producer consumerproblem
12	**Exercise – 12** (Packages) a) Write a JAVA program illustrate class path b) Write a case study on including in class path in your os environment of your package. c) Write a JAVA program that import and use the defined your package in the previous Problem
13	**Exercise - 13** (Applet) a) Write a JAVA program to paint like paint brush in applet. b) Write a JAVA program to display analog clock using Applet. c) Write a JAVA program to create different shapes and fill colors using Applet.
14	**Exercise - 14** (Event Handling) a) Write a JAVA program that display the x and y position of the cursor movement using Mouse. b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.
15	**Exercise-15** (AWT & Swings) a) Write a Java Program to create a frame with three buttons and Radio Button b) Write a Java Program to print text in different colors c) Write a JAVA program that to create a single ball bouncing inside a JPanel.
16	**Exercise-16** (JDBC) a) Write a Java program to Connect database b) Write a Java Program to insert, update, delete & select records

TEXT BOOKS	
1.	JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2.	The complete Reference Java, 8th edition, Herbert Schildt, TMH.
REFERENCE BOOKS	
1.	Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2.	Murach's Java Programming, Joel Murach
WEB RESOURCES	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.w3schools.com/java/java_data_types.asp

Electronic Devices and Circuits Laboratory
(ECE)
II B. Tech I Semester

Course Category	Lab Course	**Course Code**	**20EC3L02**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	EDC	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To plot the V-I characteristics of semi-conductor diodes, transistors.
2	To calculate ripple factor and efficiency of rectifiers
3	To plot the frequency response of different amplifiers and design of oscillator circuits

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic knowledge and analyze the characteristics of P-N Diode, Transistor, FET, UJT and SCR.	K2
CO2	Calculate the ripple factor for half wave and full wave rectifiers with and without filters	K2
CO3	Analyze CE and CC amplifiers.	K3

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2					1		2	1			1	1
CO2	1	1							2	1			1	1
CO3	1	1					1		2	1			1	1

LIST OF EXPERIMENTS:

PART A: identification of Components

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO

PART B: Any 10 of the following experiments are to be conducted

Experiment 1	P-N Junction Diode Characteristics for Ge and Si Part A: Forward bias (Calculation of forward resistance and cut-in voltage) Part B: Reverse bias (Calculation of reverse resistance)
Experiment 2	Zener Diode Characteristics Part A: V-I Characteristics-Reverse Bias (Calculation of reverse resistance and Breakdown voltage) Part B: Zener Diode as Voltage Regulator
Experiment 3	BJT Characteristics (CE Configuration) and calculation of Ri, Ro, Av and Ai. Part A: Input Characteristics Part B: Output Characteristics
Experiment 4	FET Characteristics (CS Configuration) and calculation of r_d, g_m and μ Part A: Drain Characteristics Part B: Transfer Characteristics
Experiment 5	SCR Characteristics
Experiment 6	UJT Characteristics
Experiment 7	Rectifiers Part A: Half-wave Rectifier Part B: Full-wave Rectifier
Experiment 8	Rectifiers With C and πFilter Part A: Half-wave Rectifier Part B: Full-wave Rectifier
Experiment 9	CRO Applications (Amplitude, Frequency, Phase shift, L-Figures, Gear Wheel Patterns)
Experiment 10	Design of CE Amplifier and calculate bandwidth
Experiment 11	Design of CC Amplifier and calculate bandwidth
Experiment 12	Design of CS Amplifier and calculate bandwidth

PART C: Equipment required for Laboratory

1. Boxes
2. Ammeters (Analog or Digital)
3. Voltmeters (Analog or Digital)
4. Active & Passive Electronic Components
5. Regulated Power supplies
6. Analog/Digital Storage Oscilloscopes
7. Analog/Digital Function Generators
8. Digital Multimeters
9. Decade Resistance Boxes/Rheostats
10. Decade Capacitance

Switching Theory and Logic Design Lab
(ECE)
II B. Tech I Semester

Course Category	Lab Course	**Course Code**	20EC3L03
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Basics of Digital Electronics	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To verify the truth table of logic gates
2	To verify the function of combinational of logic circuits using truth tables
3	To verify the function of sequential of logic circuits using truth tables

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To understand the concepts of Logic gates	K2
CO2	To understand concepts of combinational circuits.	K2
CO3	To understand sequential circuits by learning flip-flops and their applications.	K3

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2					1		2	1			1	1
CO2	1	1							2	1			1	1
CO3	1	1					1		2	1			1	1

LIST OF EXPERIMENTS: (Any 10 of the following experiments are to be conducted)	
Experiment 1	Verification of truth tables of Logic gates Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
Experiment 2	Design a simple combinational circuit with three variables with minimal SOP expression and verification of truth table
Experiment 3	Verification of functional table of 3-to-8-line Decoder / Demultiplexer
Experiment 4	4 variable logic function verification using 8 to 1 multiplexer.
Experiment 5	Design full adder circuit and verify its functional table.
Experiment 6	Verification of functional tables of (i) J K Edge triggered Flip – Flop (ii) J K Master Slave Flip – Flop (iii) D Flip – Flop
Experiment 7	Design a four-bit ring counter using D Flip – Flops / JK Flip Flop and verify the output
Experiment 8	Design a four-bit Johnson‘s counter using D Flip-Flops / JK Flip Flops and verify output
Experiment 9	(a) Design Four-bit buffer register using D Flip – Flops / JK Flip-Flops and verify output. (b) Design four bits shift right register using D Flip-Flops / JK Flip-Flops and verify output.
Experiment 10	Design a synchronous sequential circuit to convert 16KHz square wave frequency to 2 KHz and sketch the input and output waveforms.
Experiment 11	Design an asynchronous sequential circuit to convert 16KHz square wave frequency to 2 KHz and sketch the input and output waveforms.
Experiment 12	(a) Draw the circuit diagram of a single bit comparator and test the output (b) Testing of 7 segment Display with common cathode.

Interactive Programming
(ECE)
II B. Tech I Semester

Course Category	Skill Oriented	**Course Code**	**20EC3S01**
Course Type	Skill Oriented	**L-T-P-C**	0-0-4-2
Prerequisites	Basics of Signals	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To gain knowledge on topics like vector space, basis dimension, inner product, norm and orthogonal basis of signals using programming
2	To develop relationship for linear systems and response of LTI system using convolution using Programming.
3	To apply the concepts of Laplace, transform and Z-transform for analyzing continuous and discrete time signals and systems respectively with the help of Programming.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the knowledge of linear algebra topics like vector space, basis, dimension, inner product, norm and orthogonal basis to signals.	K3
CO2	Develop input output relationship for linear systems and Classify systems based on their properties and determine the response of LTI system using convolution	K2
CO3	Apply the Laplace transform and Z-transform for analyze of continuous and discrete time signals and systems respectively.	K3

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1									3	1
CO2	3	2	1	1									3	1
CO3	3	2	1	1									3	1

Lecture 1: Introduction to MATLAB.
Lecture 2: MATLAB Operator, functions and
Datatypes.Lecture 3: File types, Arrays and Strings
Lecture 4: Matrix and Array operations on
DataLecture 5: Practice Sessions

1. Familiarization with MATLAB
   a. Matrix Operations & Plotting using MATLAB
   b. Relational Operators, Loops & Functions using MATLAB
2. To explore the commutation of even and odd symmetries in a signal with algebraicoperations using MATLAB.
3. Solving First and Second Order differential equations and Integral equations.
4. Generation of different types of Continuous time signals and discrete time signals.
5. To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).
6. To identify a given system as linear or non-linear.
7. Convolution on Continuous Time Signals
8. To explore the time variance and time invariance property of a given system.
9. To explore causality and non-causality property of a system.
10. Generation of Signals & Signal Operations Synthesis of signals using Fourier Series.
11. Implementation of Fourier Transforms, Laplace Transforms, Z-transforms in MATLABenvironment.

Electronic Circuit Analysis
(ECE)
II B. Tech II Semester

Course Category	Professional Core	**Course Code**	**20EC4T07**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	EDC, Network Analysis	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
2	Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
3	Analyse the effect of negative feedback on amplifier characteristics and derive the characteristics.
4	Learn and understand the basic principle of oscillator circuits and perform the analysisof different oscillator circuits.
5	Compare and analyse different Power amplifiers like Class A, Class B, Class C, ClassAB and other types of amplifiers and analyse different types of tuned amplifier circuits.

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design and analysis of small signal high frequency transistor amplifier using BJT and FET.	K3
CO2	Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.	K3
CO3	Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.	K3
CO4	Know the classification of the power and tuned amplifiers and their analysis with performance comparison	K2
CO5	Demonstrate the applications of tuned amplifiers.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS O1**	**PSO 2**
CO1	2	2	2	2	2	-	-	-	-	-	2	2	2	2
CO2	2	2	2	2	2	-	-	-	-	-	2	2	2	2
CO3	2	2	2	2	2	-	-	-	-	-	2	2	2	2
CO4	2	2	2	2	2	-	-	-	-	-	2	2	2	2
CO5	2	2	2	2	2	-	-	-	-	-	2	2	2	2

COURSE CONTENT	
UNIT-I	**Small Signal High Frequency Transistor Amplifier models:** **BJT:** Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product. **FET:** Analysis of common Source and common drain Amplifier circuits at high frequencies.
UNIT-II	**Multistage Amplifiers:** Classification of amplifiers, methods of coupling**, c**ascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT. **Feedback Amplifiers:** Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.
UNIT-III	**Feedback Amplifiers:** Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.
UNIT-IV	**Oscillators:** Oscillator principle, condition for oscillations, types of oscillators, RC phase shift and Wien bridge oscillators with BJT and FET and their analysis, generalized analysis of LC Oscillators, Hartley and Colpitts‘s oscillators using BJT, Frequency and amplitude stability of oscillators.
UNIT-V	**Power Amplifiers:** Classification of amplifiers (A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks. **Tuned Amplifiers**: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, staggered tuned amplifiers

TEXT BOOKS	
1.	Integrated Electronics- J. Mill man and C.C. Halkias, Tata McGraw-Hill, 1972.
2.	Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition,2009.
3	Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications, 2006
REFERENCE BOOKS	
1.	Electronic Circuit Analysis and Design – Donald A. Neaman, McGrawHill,2010.
2.	Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, SixthEdition,2011.
3.	Electronic Circuit Analysis-B.V. Rao, K.R. Rajeswari,P.C.R.Pantulu, K.B.R. Murthy, Pearson Publications.

Digital IC Applications

(ECE)

II B. Tech II Semester

Course Category	Professional Core	**Course Code**	**20EC4T08**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	STLD	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Study the concepts of hardware description language for various levels of abstraction
2	Understand coding and designing of Combinational logic circuits using HDL
3	Understand coding and designing of Sequential logic circuits using HDL
4	Understand the concepts of MOS transistor for designing Combinational Logic circuits
5	Understand the concepts of MOS transistor for designing Sequential Logic circuits

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Model logic circuits using hardware description language for digital applications.	Apply
CO2	Analyze and design basic digital circuits with combinatorial logic circuits using VHDL.	Analyze
CO3	Analyze and design basic digital circuits with sequential logic circuits using VHDL.	Analyze
CO4	Implement Combinational Logic circuits using MOS transistors	Apply
CO5	Implementsequential Logic circuits using MOS transistors	Apply

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	1	2	2		1								1	1
CO2	3	2	1	1	1								1	1
CO3	3	3	2	1	1								1	1
CO4	2	3	3	2	1								1	1
CO5	2	2	2	2	1								1	1

COURSE CONTENT	
UNIT-I	**Hardware Description Languages.** **VHDL:** Introduction to VHDL, entity declaration, architecture, data-flow, behavioral and structural style of modeling's, data types, data objects, configuration declaration, package, generic, operators and identifiers, PROCESS, IF, CASE & LOOP statements, VHDL libraries. **Verilog HDL:** Introduction to Verilog HDL, data types, data operators, module statement, wire statement, if-else statement, case-end case statement, Verilog syntax and semantics (qualitative approach)
UNIT-II	**Combinational Logic Design:** Parallel binary adder, carry look ahead adder, BCD adder, Multiplexers and demultiplexers and their use in combinational logic design, ALU, digital comparators, parity generators, code converters, priority encoders. (Qualitative approach of designing and modeling the mentioned combinational logic circuits with relevant digital ICs using HDL)
UNIT-III	**Sequential Logic Design:** Registers, applications of shift registers, ripple or asynchronous counters, synchronous counters, synchronous and asynchronous sequential circuits, hazards in sequential circuits. (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs using HDL)
UNIT-IV	**Combinational MOS Logic Circuits**: Introduction, MOS logic circuits with depletion nMOS loads: two-input NOR gate, generalized NOR structure with multiple inputs, transient analysis of NOR gate, two-input NAND gate, generalized NAND structure with multiple inputs, transient analysis of NAND gate, CMOS logic circuits: CMOS NOR2 gate, CMOS NAND2 gate, complex logic circuits, complex CMOS logic gates, AOI and OAI gates, Pseudo-nMOS gates, CMOS full-adder circuit, CMOS transmission gates (Pass Gates), complementary pass-transistor logic.
UNIT-V	**Sequential MOS Logic Circuits:** Introduction, behavior bistable elements, SR latch circuit, clocked latch and flip-flop circuits: clocked SR latch, clocked JK latch, master-slave flip-flop, CMOS D-latch and Edge-triggered flip-flop, Schmitt trigger circuit, basic principles of pass transistor circuits.

TEXT BOOKS	
1.	Digital Design Principles & Practices - John F. Wakerly, PHI/ Pearson Education Asia, 3rd Edition, 2005.
2.	CMOS Digital Integrated Circuits-Analysis and Design – Sung-Mo Kang & Yusuf Leblebici - Tata McGraw Hill Publishing Company Limited, 2006.
REFERENCE BOOKS	
1.	VHDL/Verilog Primer - J. Bhasker, Pearson Education/ PHI, 3rd Edition.
2.	Modern Digital Electronics – R.P.Jain - Fourth Edition – Tata McGraw Hill Education Private Limited, 2010.
3.	Fundamentals of Digital Logic with VHDL Design - Stephen Brown, ZvonkoVranesic, McGraw Hill, 3rd Edition.

Control Systems

(ECE)

II B. Tech II Semester

Course Category	Professional Core	**Course Code**	**20EC4T09**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Network analysis	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Learn the fundamental concepts of Control systems and mathematical modeling of the system difference between open loop control system and closed loop control system
2	Learn the representation of various control systems transfer functions in the form of block diagrams and signal flow graphs and obtain a simplified transfer function
3	Study the time domain specifications and frequency domain specifications Understand the difference between transient response and steady state response
4	Understand the stability of control systems from the S domain analysis
5	Understand the concept of state variable analysis

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Represent the mathematical model of a system and transfer function of mechanical & electrical systems.	K1
CO2	Determine the response of different servo motors and reduction techniques.	K2
CO3	Analyze the stability of different systems.	K3
CO4	Determine the frequency response of different order systems.	K2
CO5	Know the controllability and observability of control systems using state space techniques	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1										2	2
CO2	3	2	1										2	2
CO3	3	2	1										2	2
CO4	3	2	1										2	2
CO5	3	2	1										2	2

COURSE CONTENT	
UNIT-I	**CONCEPTS OF CONTROL SYSTEMS**: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback. **MATHEMATICAL MODELS OF PHYSICAL SYSTEMS**: Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems
UNIT-II	**TRANSFER FUNCTION REPRESENTATION:** Transfer Function of DC Servo motor - AC Servo motor- Synchro -transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples –Block diagram algebra– Representation by Signal flow graph - Reduction using mason‘s gain formula.
UNIT-III	**TIME RESPONSE ANALYSIS:** Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications –Steady state response - Steady state errors and error constants. **STABILITY ANALYSIS IN S - DOMAIN:** The concept of stability – Routh‘s stability criterion – qualitative stability and conditional stability – limitations of Routh‘s stability.
UNIT-IV	**ROOT LOCUS TECHNIQUE:** The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci. **FREQUENCY RESPONSE ANALYSIS:** Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion
UNIT-V	**STATE VARIABLE ANALYSIS:** Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Solution of state equations and Concepts of Controllability and Observability - Problem solving.

TEXT BOOKS	
1.	Automatic Control Systems- 8th edition– by B. C. Kuo–John wiley andson‘s,2003
2.	Control System Engineering- J.Nagarath and M.Gopal, New Age International Publishers, 5th Edition, 2009.
REFERENCE BOOKS	
1.	Modern Control Engineering- Katsuhiko Ogata, Pearson, 3th Edition, 1998
2.	Control Systems– A NagoorKani, 2nd edition, RBA Publications.
3.	Control Systems Engineering- S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, Pearson, First Impression,2015

Random Variables and Stochastic Processes

(ECE)

II B. Tech II Semester

Course Category	Professional Core	**Course Code**	**20EC4T10**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Probability	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn:	
1	basic concepts of probability, theorems along with mathematical solution, type of operations that can be performed with random variables
2	two random variables, characterization of joint density and distribution functions
3	time axis to the Random Variable
4	frequency domain representation of Random variable
5	responses are studied in terms of convolution, mean, squared values and linear systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concept of a Random variable and its classification	K2
CO2	Understand the significance of Moments of a random variable	K2
CO3	Differentiate between single and multiple random variables	K3
CO4	Understand the concept of a random process and its classification	K2
CO5	Understand the frequency domain representation of a Random Process, and the relevance of a Random process in a communication system	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	1							2	2	2
CO2	3	2	2	1	1							2	1	2
CO3	2	2	3	1	1							1	2	1
CO4	2	3	2	2	1							2	2	2
CO5	2	1	2	3	2							1	2	2

COURSE CONTENT	
UNIT-I	**THE RANDOM VARIABLE** Review of Probability: Joint Probability, Conditional Probability, Baye‘s Theorem;

	Definition of a Random Variable, Conditions for a function to be a Random Variable, Discrete, Continuous and Mixed Random Variable. Distribution and Density functions of Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and their properties. Conditional distribution, conditional density functions and their properties.
UNIT-II	**OPERATION ON ONE RANDOM VARIABLE – EXPECTATIONS** Introduction, Expected Value of a Random Variable, function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev‘s Inequality, Markov‘s inequality, Moment Generating Function, Characteristic Function of a Random Variable and their properties, Transformations of a Random Variable – Monotonic, Non-monotonic
UNIT-III	**MULTIPLE RANDOM VARIABLES** Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density –Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, Equal and Unequal Distributions. **OPERATIONS ON MULTIPLE RANDOM VARIABLES** Expected Value of a function of Random Variables - Joint Moments about the origin, Joint Central Moments, Joint Characteristic Functions, Joint Gaussian Random Variables - Two Random Variables, N-Random Variables and their Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.
UNIT-IV	**RANDOM PROCESSES – TEMPORAL CHARACTERISTICS** The Random Process Concept, Classification of Processes, Deterministic andNon-deterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order, Second- Order, Wide-Sense(N-Order) and Strict-Sense Stationary Processes, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation, Cross-Correlation functions and their properties. Covariance, Gaussian and Poisson Random Processes.
UNIT-V	**RANDOM PROCESSES – SPECTRAL CHARACTERISTICS** Power Spectrum and its properties, relationship between Power Spectrum and Autocorrelation Function, Power Density Spectrum and its Properties, Relationship between power spectrum and cross correlation function. **LINEAR SYSTEMS WITH RANDOM INPUTS** Random Signal response of Linear Systems - system response, convolution, mean and mean-squared value of system response, autocorrelation function of response, cross-correlation functions of input and output, spectral characteristics of system response - power density spectrum, power density spectrums of input and output, band limited band pass, and narrowband processes, Quadrature components of noise and their properties.

TEXT BOOKS	
1.	Probability, Random Variables & Random Signal Principles - Peyton Z Peebles, 4th Edition, TMH,2001.
2.	Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4th Edition, PHI, 2002.
REFERENCE BOOKS	
1.	Schaum's Outline of Probability, Random Variables, and Random Processes,1997.
2.	An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook,1968.
3.	Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

Python Programming

Common to EEE and ECE

Course Category	Engineering	**Course**	20CS4T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about Python programming language syntax, semantics, and the runtime environment.
2	To be familiarized with universal computer programming concepts like data types,
3	To be familiarized with general computer programming concepts like conditional execution,
4	To be familiarized with general coding techniques and object-oriented programming

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop essential programming skills in computer programming concepts like data types, containers.	K3
CO2	Apply the basics of programming in the Python language.	K3
CO3	Solve coding tasks related conditional execution, loops.	K3
CO4	Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming.	K3
CO5	Make use of Exceptions and GUI interfaces for developing	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating,K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO 1	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO 2	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO 3	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO 4	3	2	2	3	3	-	-	-	-	-	-	1	3	3
CO 5	3	2	2	3	3	-	-	-	-	-	-	1	3	3

COURSE CONTENT	
UNIT I	Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
UNIT II	Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement, Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.
UNIT III	List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program‘s Namespace, Higher Order Function.
UNIT IV	File Operations: Reading config files in python, Writing log files in python, Understanding writelines(), Manipulating file pointer using seek, Programming using file operations Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.
UNIT V	Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI - Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUIResources. Programming**:** Introduction to Programming Concepts with Scratch

TEXT BOOKS	
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2.	Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
REFERENCE BOOKS	
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2.	Core Python Programming, Dr. R. Nageswara Rao, ISBN: 9789386052308, 3ed, Wiley Publication, 2019.
WEB RESOURCES	
1.	https://www.tutorialspoint.com/python3/python_tutorial.pdf

Python Programming Laboratory
Common to ECE and EEE

Course Category	Engineering Sciences	**Course Code**	20CS4L03
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment**	15
		Semester End Examination	35
		Total Marks	50

COURSE OBJECTIVES	
1	To acquire programming skills in core Python and to acquire Object Oriented Skills in Python
2	To develop the skill of designing Graphical user Interfaces in Python
3	To develop the ability to write database applications in Python

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Write, Test and Debug Python Programs and Use Conditionals and Loops for Python Programs	K4
CO2	Use functions and represent Compound data using Lists, Tuples and Dictionaries	K3
CO3	Use various applications using python	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	-	-	-	-	-	-	2	3	3
CO2	3	2	1	1	1	-	-	-	-	-	-	2	3	3
CO3	3	2	1	1	1	-	-	-	-	-	-	2	3	3

COURSE CONTENT

1. Write a program that asks the user for a weight in kilograms and converts it to pounds.There are 2.2 pounds in a kilogram.
2. Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
3. Write a program that asks the user for their name and how many times to print it.
4. Write a program that asks the user for an integer and creates a list that consists of the factorsof that integer.
5. Write a function called *sum_digits* that is given an integer num and returns the sum of thedigits of num.
6. Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
7. Write a function called *number_of_factors*that takes an integer and returns how many factorsthe number has.
8. Write a function called *is_sorted*that is given a list and returns True if the list is sorted andFalse otherwise.
9. Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In thefunction definition, set the default value of n to 2.
10. Write a function called primes that is given a number n and returns a list of the first n primes.Let the default value of n be 100.
11. Write a function called merge that takes two already sorted lists of possibly different lengths,and merges them into a single sorted list.
    - Do this using the sort method. (b) Do this without using the sort method.
12. Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
13. Write a Python Program to implement the inheritance
14. Write a program to demonstrate Try/except/else.
15. Write a program to demonstrate try/finally and with/as.

Electronic Circuit Analysis Laboratory

(ECE)
II B. Tech II Semester

Course Category	Lab Course	**Course Code**	**20EC4L04**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	EDC	**InternalAssessment** **Semester EndExamination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To analyze frequency response of multistage amplifiers.
2	To illustrate the effect of feedback on the performance of the amplifier.
3	To design oscillators and power amplifiers for the given specifications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the frequency response of multistage amplifiers.	K2
CO2	Explain the effect of feedback on the performance of the amplifier.	K2
CO3	Design Oscillators and Power amplifiers for the given specifications.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3										1		3	3
CO2	3	2									2	1	2	3
CO3	3	2	2								3		2	3

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be conducted

A) DESIGN AND SIMULATION IN SIMULATION LAB USING MULTISIM:

1. Voltage Series Feedback Amplifier.
2. Current Shunt Feedback Amplifier.
3. RC Phase Shift Oscillator.
4. Colpitts‘s Oscillators.
5. Two Stage RC Coupled Amplifier.
6. Darlington Pair Amplifier.
7. Bootstrapped Emitter Follower
8. Class-ASeries-Fed Power Amplifier.
9. Class B Complimentary Symmetry Amplifier.
10. Single Tuned Voltage Amplifier.

B) TESTING IN THE HARDWARE LABORATORY:

1. Design of Voltage Series Feedback Amplifier.
2. Design of Current Shunt Feedback Amplifier.
3. Design of RC Phase Shift Oscillator.
4. Design of Colpitts‘s Oscillators.
5. Design of Two Stage RC Coupled Amplifier.
6. Design of Darlington Pair Amplifier.
7. Design of Bootstrapped Emitter Follower
8. Design of Class-ASeries-Fed Power Amplifier.
9. Design of Class B Complimentary Symmetry Amplifier.
10. Design of Single Tuned Voltage Amplifier

Digital IC Applications Laboratory
(ECE)
II B. Tech II Semester

Course Category	Lab Course	**Course Code**	**20EC4L05**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Digital Electronics	**InternalAssessment** **Semester EndExamination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To understand and implement the working of digital logic circuits.
2	Understand programming concepts using VHDL/Verilog
3	To design and implement digital systems using logic ICs.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop behavioral, data flow and structural models for digitalcircuits.	K3
CO2	Simulate VHDL models of digital circuits using CAD tool.	K2
CO3	Synthesize sequential and combinational circuits.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 –High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2		1	2	2								2	2
CO2	2		1	2	2								2	2
CO3	2		2	2	2								2	2

LIST OF EXPERIMENTS: Conduct any 12 Experiments

1.	Realization of Logic Gates
2.	Design of Full Adder using 3 modeling systems
3.	3 to 8 Decoder -74138
4.	8 to 3 Priority Encoder - 74148
5.	8 x 1 Multiplexer-74151
6.	4- Bit comparator-7485
7.	D Flip-Flop-7474
8.	Decade counter -7490
9.	Universal Shift Register 74194
10.	8-bit serial in-parallel out and parallel in-serial out
11.	Fast In and Fast Out (FIFO)
12.	MAC (Multiplier and Accumulator)
13.	8 x 4 ROM
14.	ALU Design.

Equipment/Software required:

1. Xilinx Vivado software / Equivalent Industry Standard Software
2. Xilinx Hardware / Equivalent hardware.
3. Personal computer system with necessary software to run the programs and implement.

Internet of Things Applications
(ECE)
II B. Tech II Semester

Course Category	Skill Oriented	**Course Code**	20EC4S02
Course Type	Laboratory	**L-T-P-C**	0-0-4-2
Prerequisites	Basics of Embedded Systems	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To understand fundamentals of various technologies of Internet of Things.
2	To know various communication technologies and the connectivity of devices using web and internet in the IoT environment.
3	To understand the implementation of IoT by studying case studies like Smart Home,Smart city, etc.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	apply various technologies of Internet of Things to real time applications.	K2
CO2	apply various communication technologies and connect the devices using web and internet in the IoT environment.	K3
CO3	implement IoT to study Smart Home, Smart city, etc	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2		2								1	2
CO2	2	2	2		3								2	1
CO3	1	2	3		2								2	2

Lecture 1: Introduction to IoT
Lecture 2: Challenges in IoT
Lecture 3: Applications of IoT

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when _1‘/‘0‘ is received from smartphone using Bluetooth.
8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to thing speak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

Analog ICs and Applications
(ECE)
III B Tech I Semester

Course Category	Professional Core	**Course Code**	20EC5T11
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Electronics Circuit Analysis	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	To understand the basic operation &performance parameters of differential amplifiers and Op-Amp
2	To learn the linear and non-linear applications of operational amplifiers.
3	To understand the analysis & design of different types of active filters using op-amps
4	To learn the internal structure, operation and applications of different analog ICs
5	To Acquire knowledge about Digital to Analog and Analog to Digital Converters

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand differential amplifier and Op-Amp concepts	K2
CO2	Design circuits using operational amplifiers for various applications.	K3
CO3	Analyze and design amplifiers and active filters using Op-amp.	K4
CO4	Understand thoroughly the operational amplifiers with linear integrated circuits.	K2
CO5	Understand and Acquire knowledge about Digital to Analog and Analog to Digital Converters.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO2	1	2	3	2	-	-	-	-	-	-	-	-	1	2
CO3	1	2	3	2	-	-	-	-	-	-	-	-	1	2
CO4	1	1	2	1	-	-	-	-	-	-	-	-	1	2
CO5	1	1	2	1	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT-I	**Differential amplifies:** Introduction, Differential Amplifier DC and AC Analysis, Basic Current Mirror Circuit, Improved Version, current repeater circuit, Wilson current source. **OP-Amp:** Block Diagram, Characteristics of Op-Amp Ideal and Practical, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slew rate, CMRR, PSRR. etc, Measurements of Op-Amp Parameters. Three terminal Voltage Regulators 78xx & 79xx Series, current Booster, adjustable voltage, dual power supply with 78xx & 79xx. Review on IC packages, technologies and fabrication.
UNIT-II	**Linear and non-Linear applications of op-amps:** Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generators, Comparators, Multivibrators , Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.
UNIT-III	**Active filters, Analog Multipliers and Modulators**: Design & Analysis of Butter worth active filters–1st order,2nd order LPF,HPF filters. Band pass, Band reject and all pass filters..Chebysehev 1st order,2nd order LPF,HPF filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits
UNIT-IV	**Timers** : Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; **PLL** - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of PLL
UNIT-V	**Digital to Analog and Analog to Digital Converters**: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12-bit ADC).

TEXT BOOKS	
1.	Linear Integrated Circuits - D. Roy Choudhury, New Age International (p)Ltd, 2nd Edition, 2003.
2.	Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.
REFERENCE BOOKS	
1.	Operational Amplifiers & Linear Integrated Circuits - Sanjay Sharma, SK Kataria& Sons; 2nd Edition, 2010
2.	Operational Amplifiers & Linear Integrated Circuits - R.F.Coughlin& Fredrick Driscoll, PHI, 6th Edition, 2000.
3.	Operational Amplifiers & Linear ICs - David A Bell, Oxford Uni. Press, 3rd Edition, 2011.
WEB RESOURCES:	
1	http://nptel.ac.in/courses/1171070

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES
III B. Tech I Semester

Course Category	Professional Core	**Course Code**	20EC5T13
Course Type	Theory	**L-T-P-C**	3- 0 -0- 3
Prerequisites	Vector calculus ,Review of Co-ordinate Systems	**Internal Assessment** **Semester End Examination** **Total Marks**	25 75 100

COURSE OBJECTIVES	
1	To study the transmission line parameters, transmission line equations, infinite line and lossless transmission lines
2	To study the input impedance relations, λ/4, λ /2, λ/8 lines and their impedance transformations, Smith Chart, Stub Matching.
3	To study the concepts of electric fields, energy density, Maxwell‘s two equations for electrostatic fields, and Capacitance.
4	To study the concepts in magnetic fields, and Maxwell‘s equations in different final form and boundary conditions.
5	To study the electromagnetic waves in conducting and perfect dielectric media, wave propagation, polarization, and Poynting Theorem.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Calculate the voltage and current, derive the expressions for input impedance of transmission lines, phase and group velocities.	K3
CO2	Interpret the short circuit and open circuit lines, calculate reflection coefficient, VSWR.	K3
CO3	Calculate electric field intensity, electric flux density using Maxwell‘s equations.	K2
CO4	Interpret the Maxwell‘s equations for magnetic fields, transformer EMF	K2
CO5	Gain the knowledge of uniform plane wave characteristics in various media, reflection and refraction of plane waves.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1		2			1	2		2	1	1
CO2	3	2	2	1		2			1	2		2	2	
CO3	3	3	2	2						1		2	3	
CO4	3	3	2	2						1		2	3	
CO5	3	3	3	2						1		2	2	

COURSE CONTENT	
UNIT I	**Transmission Lines-I:** Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems
UNIT II	**Transmission Lines– II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, λ/8,λ/4 and λ /2 Lines – . Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.
UNIT III	**Electrostatics:** Coulomb‘s Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell‘s Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson‘s and Laplace‘s Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems
UNIT IV	**Magneto Statics:** Biot-Savart Law, Ampere‘s Circuital Law and Applications, Magnetic Flux Density, Maxwell‘s Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere‘s Force Law, Inductances and Magnetic Energy. Illustrative Problems, Maxwell‘s Equations (Time Varying Fields): Faraday‘s Law and Transformer EMF, Inconsistency of Ampere‘s Law and Displacement Current Density, Maxwell‘s Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.
UNIT V	**EM Wave Characteristics:** Wave Equations for Conducting and Perfect Dielectric Media Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

TEXT BOOKS	
1.	Elements of Electromagnetic–Matthew N.O.Sadiku, Oxford Univ. Press,3rded.,2001.
2.	Electromagnetic Waves and Radiating Systems–E.C.Jordan and K.G.Balmain, PHI,2ndEdition,2000.
3.	Electromagnetic Waves and Transmission Line—Y Mallikarjuna Reddy, Universities Press, 2015
REFERENCE BOOKS	
1.	Electromagnetic Field Theory and Transmission Lines–GSN Raju, Pearson Education
2.	Engineering Electromagnetic –William H. Hayt Jr. and John A.Buck, TMH, 7 th ed., 2006.
3.	Electromagnetic Field Theory and Transmission Lines : G SasiBhushanaRao, WileyIndia2013.

ANALOG AND DIGITAL COMMUNICATION

III B. Tech I Semester

Course Category	Professional core	**Course Code**	20EC5T14
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Signals and systems Probability theory	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES Students undergoing this course are expected to	
1	Familiarize with the fundamentals of analog communication systems.
2	Familiarize with various techniques for analog modulation and demodulation of signals
3	Familiarize with basic techniques for generating and demodulating various pulse modulated signals.
4	Understand the pulse digital modulation systems such as PCM, DPCM and DM.
5	Categorize various digital modulation techniques.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Differentiate various Amplitude modulation and demodulation schemes and their spectral characteristics techniques	K2
CO2	Understand the performance of Frequency modulation and demodulation schemes and their spectral characteristics techniques	K2
CO3	Distinguish the performance of pulse digital modulation techniques	K4
CO4	Interpret digital modulation techniques like ASK, FSK, PSK etc.	K2
CO5	Evaluate the performance of digital modulation techniques for coherent andnon coherent detection.	K5

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	3	2			1								2	2
CO2	3	2			1								2	2
CO3	3	2			1								2	2
CO4	3	2			1								2	2
CO5	3	2			1									

COURSE CONTENT	
UNIT I	**AMPLITUDE MODULATION ,DSB& SSB MODULATION:** **AMPLITUDE MODULATION** : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition,

	Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector. **DSB & SSB MODULATION:** Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AMSSB Modulated waves. Demodulation of SSB Waves.
UNIT II	**VSB MODULATION & ANGLE MODULATION**: **VESTIGIAL SIDE BAND MODULATION:** Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems. **ANGLE MODULATION:** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrowband FM, Wideband FM, Constant Average Power, Transmission bandwidth of FM Wave-Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase lockedloop. Comparison of FM & AM.
UNIT III	**PULSE ANALOG & DIGITAL MODULATION:** **PULSE MODULATION:** Types of Pulse modulation, PAM (Single polarity, double polarity) PWM & PPM Generation & Detection, Time Division Multiplexing, TDM Vs FDM. **PULSE DIGITAL MODULATION:** Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: (Sampling, Quantization & Encoding), Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.
UNIT IV	**DIGITALMODULATIONTECHNIQUES:** Introduction, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential Phase Shift Keying, DEPSK,QPSK, M-ary Phase Shift Keying, M-ary Amplitude Shift Keying, M-ary Frequency Shift Keying, similarity between digital modulation techniques.
UNIT V	**DATA TRANSMISSION:** Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK. Calculation of error probability of ASK, BPSK, BFSK, QPSK.

TEXT BOOKS	
1.	Principles of Communication Systems-Simon Haykin, John Wiley, 2nd Edition, 2007
2.	Digital communications- Simon Haykin, JohnWiley,2005
REFERENCE BOOKS	
1.	Communication Systems – B P Lathi, B S Publication, 2006.
2.	Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
3.	Communication Systems (Analog And Digital) | Sanjay Sharma, S.K.Kataria& Sons, 2013

SURVEYING

OPENELECTIVE

Course Category	Open Elective	**Course Code**	20CE5T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	----------	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
1	Introduce the students to basic principles of surveying.
2	Demonstrate the basic surveying skills.
3	Perform various methods of linear and angles measurements.
4	Enable the students to use surveying equipment‘s
5	Integrate the knowledge and produce topographical map.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the fundamentals in chain and plane table surveying.	K2
CO2	Identify the angles on filed by compass survey.	K2
CO3	Apply knowledge of leveling in surveying.	K2
CO4	Measure the horizontal and vertical angles by using Theodolite and Total Station instruments.	K3
CO5	Estimate the volume and area of irregular boundaries of filed.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	--	--	1	--	--	--	--	3	--	--	2	3	--
CO2	3	3	1	2	--	--	--	--	2	--	--	3	3	--
CO3	2	--	--	3	--	--	--	--	3	--	--	--	2	--
CO4	2	3	1	3	3	--	--	--	3	--	--	3	3	--
CO5	3	3	3	3	--	--	--	--	--	--	--	3	3	3

COURSE CONTENT	
UNIT I	INTRODUCTION: Definition-Uses of surveying, Objectives, Principles and Classifications of Surveying – Errors in survey measurements. DISTANCEMEASUREMENTCONVENTIONS AND METHODS: Use of chain and tape, Errors and corrections to linear measurements, overview of plane table surveying
UNIT II	COMPASS SURVEY: Definition- Principles of Compass survey - Meridians, Azimuths and Bearings, declination. Computation of angle - Purpose and types of Traversing - traverse adjustments – Local attraction.
UNIT III	LEVELING: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. CONTOURING: Characteristics and uses of contours- methods of conducting contour surveys and their plotting.
UNIT IV	THEODOLITE: Theodolite, description, principles - uses – temporary and permanent adjustments, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Omitted Measurements. Introduction to geodetic surveying - Total Station and Global Positioning System. CURVES: Types of curves, design and setting out. TACHEOMETRIC SURVEYING: Stadia and tangential methods of Tachometry. MODERN SURVEYING METHODS: Principle and types of E.D.M. Instruments, Total station advantages and Applications. Introduction to Global Positioning System.
UNIT V	COMPUTATION OF AREAS AND VOLUMES: Computation of areas along irregular boundaries and regular boundaries. Embankments and cutting for a level section and two- level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits

TEXT BOOKS	
1.	Surveying (Vol No.1, 2 &3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd, New Delhi.
2.	Text book of Surveying by C. Venkataramaiah, University press, India (P) limited.
REFERENCE BOOKS	
1.	Text book of Surveying by S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2.	Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/105107122/1

Renewable Energy Engineering
(Open Elective – I offered to other departments)

Course Category	Professional Core Courses	**Course Code**	20EE5T13
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To study the solar radiation data, equivalent circuit of PV cell and its I-V & P-V characteristics
2	To understand the concept of Wind Energy Conversion & its applications
3	To study the principles of biomass and geothermal energy
4	To understand the principles of Ocean Thermal Energy Conversion (OTEC), motion of waves and power associated with it
5	To study the various chemical energy sources such as fuell cell and hydrogen energy along with their operation and equivalent circuit

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth‘s surface and solar Energy Storage	K4
CO2	Illustrate the components of wind energy systems	K3
CO3	Illustrate the working of biomass, digesters and Geothermal plants	K3
CO4	Demonstrate the principle of Energy production from OTEC, Tidal and Waves	K3
CO5	Evaluate the concept and working of Fuel cells & MHD power generation	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	-	-	1	-	-	-	-	1	2	2
CO2	3	2	1	1	-	-	1	-	-	-	-	1	2	2
CO3	3	1	1	1	-	-	1	-	-	-	-	1	2	2
CO4	3	1	1	1	-	-	1	-	-	-	-	1	2	2
CO5	3	1	1	1	-	-	1	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT 1	**Solar Energy:** Introduction - Renewable Sources - prospects, Solar radiation at the Earth Surface - Equivalent circuit of a Photovoltaic (PV) Cell - I-V & P-V Characteristics - Solar Energy Collectors: Flat plate Collectors, concentrating collectors - Solar Energy storage systems and Applications: Solar Pond - Solar water heating - Solar Green house.
UNIT 2	**Wind Energy**: Introduction - basic Principles of Wind Energy Conversion, the nature of Wind - the power in the wind - Wind Energy Conversion - Site selection considerations - basic components of Wind Energy Conversion Systems (WECS) - Classification - Applications.
UNIT 3	**Biomass and Geothermal Energy:** **Biomass:** Introduction - Biomass conversion technologies - Photosynthesis, factors affecting Bio digestion - classification of biogas plants - Types of biogas plants - selection of site for a biogas plant **Geothermal Energy**: Introduction, Geothermal Sources – Applications - operational and Environmental problems.
UNIT 4	**Energy From oceans, Waves & Tides:** **Oceans:** Introduction - Ocean Thermal Electric Conversion (OTEC) – methods - prospects of OTEC in India. **Waves:** Introduction - Energy and Power from the waves - Wave Energy conversion devices. **Tides:** Basic principle of Tide Energy -Components of Tidal Energy.
UNIT 5	**Chemical Energy Sources:** **Fuel Cells**: Introduction - Fuel Cell Equivalent Circuit - operation of Fuel cell - types of Fuel Cells - Applications. **Hydrogen Energy:** Introduction - Methods of Hydrogen production - Storage and Applications **Magneto Hydro Dynamic (MHD) Power generation:** Principle of Operation - Types.

TEXT BOOKS	
1	G.D.Rai, Non-Conventional Energy Sources, Khanna Publications, 2011
2	John Twidell & Tony Weir, Renewable Energy Sources, Taylor & Francis, 2013
REFERENCE BOOKS	
1	S.P.Sukhatme & J.K.Nayak, Solar Energy-Principles of Thermal Collection and Storage, TMH, 2011
2	John Andrews & Nick Jelly, Energy Science- principles, Technologies and Impacts, Oxford, 2nd edition, 2013
3	Shoba Nath Singh, Non- Conventional Energy Resources, Pearson Publications, 2015
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/121/106/121106014/
2	https://nptel.ac.in/courses/103/107/103107157/

III Year I Semester
OPERATIONS RESEARCH
(for CE, EEE, ECE, IT)

Course Category	Open Elective	**Course Code**	20ME5T21
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Applications of operations research through LPP.
2	Formulation of objective function through transportation and assignment problems.
3	How to sequence the jobs and machines while processing and Replacement of machine/equipment.
4	The applications of waiting line problems and operations research through DPP.
5	Deterministic and stochastic models.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Formulate the objective function by linear programming problem and solution through various models.	K3
CO2	Evaluate optimal solutions to the objective function with the knowledge of transportation and assignment problems.	K3
CO3	Apply the sequencing of the jobs on a machine and items replacement**s**	K4
CO4	Apply the principle of dynamic programming and service rate.	K3
CO5	Apply the inventory models in balancing the stock and demand ratio for profits	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	-	-	-	-	-	3	-	3	1
CO2	3	3	3	1	3	-	-	-	-	-	3	-	3	1
CO3	3	3	3	1	3	-	-	-	-	-	3	-	3	1
CO4	3	3	3	2	3	-	-	-	-	-	3	-	3	2
CO5	3	3	3	1	3	-	-	-	-	-	3	-	3	2

COURSE CONTENT

UNIT I

INTRODUCTION: Development – definition– characteristics and phases – types of operation research models – applications.

ALLOCATION: Linear programming problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle

UNIT II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy,

ASSIGNMENT PROBLEM – formulation – optimal solution - variants of assignment problem- travelling salesman problem.

UNIT III

SEQUENCING – Introduction – flow –shop sequencing –*n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through _m‘ machines.

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT IV

WAITING LINES: Introduction – single channel – poison arrivals –exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

DYNAMIC PROGRAMMING: Introduction – Bellman‘s principle of optimality – applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

UNIT V

INVENTORY: Introduction – single item – deterministic models –purchase inventory models with one price break and multiple price breaks – shortages are not allowed – stochastic models – demand may be discrete variable or continuous variable – instantaneous production. Instantaneous demand and continuous demand and no set up cost. ABC & VED Analysis.

TEXT BOOKS

1. Operations Research / S.D.Sharma-Kedarnath
2. Operations Research/S Kalavathy / Vikas Publishers

REFERENCE BOOKS

1. Operations Research / A.M.Natarajan, P. Balasubramani, A.Tamilarasi / Pearson Education.
2. Operations Research / R.Pannerselvam,PHI Publications.
3. Operations Research / Wagner/ PHI Publications.
4. Operations Research / DS Cheema/University Science Press
5. Operations Research / Ravindran, Philips, Solberg / Wiley publishers.

WEB RESOURCES

1. http://www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html
2. https://nptel.ac.in/courses/110106062

Entrepreneurship
(ECE)
III B Tech I Semester

Course Category	Open Elective	**Course Code**	20HM5T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand different Entrepreneurial traits.	K2
CO2	Identify and compare the financial institutions supporting entrepreneurship.	K3
CO3	Understand the functioning and problems faced by MSMEs (Micro Small Medium Enterprises)	K2
CO4	Identify Entrepreneurial opportunities for women.	K3
CO5	Analyze different market, technical factors and prepare a project report based on guidelines.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	0	0	0	0	0	1	0	3	2	1	3	3	2	1
CO2	0	0	0	0	0	1	0	3	0	2	3	1	1	2
CO3	0	0	0	0	0	1	1	3	1	1	0	3	1	2
CO4	0	0	0	0	0	1	0	3	1	1	0	3	1	2
CO5	0	1	1	0	0	1	2	3	1	3	3	3	2	1

COURSE CONTENT	
UNIT-I	**Unit – I Introduction to Entrepreneurship** Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving – Writing Business Plan, Evaluating Business Plans.
UNIT-II	**UNIT-II Institutional and financial support to Entrepreneurship** Institutional/financial support: Schemes and functions of Directorate of Industries, IFCI, District Industries Centers (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs). Khadi and Village Industries Commission (KVIC), Technical Consultancy Organization (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).(short answers only), Start up culture.
UNIT-III	**UNIT III Micro, Small and Medium Enterprises**: Importance and role of MSMEs in economic development, Types of MSMEs, Policies and their support to MSMEs growth and growth strategies. Sickness in small business and remedies – small entrepreneurs in International business.
UNIT-IV	**Unit – IV Women Entrepreneurship and Start up Culture** Role & importance, profile of women Entrepreneur, problems of women Entrepreneurs, women Entrepreneurship Development in India -Steps taken by the Government to promote women entrepreneurship in India, Associations supporting women entrepreneurs. Successful Entrepreneurs (case studies).
UNIT-V	**Unit-V: Project Formulation and Appraisal** Preparation of Project Report –Content; Guidelines for Report preparation – Project Appraisal techniques –economic – Steps Analysis; Financial Analysis; Market Analysis; Technical Feasibility.

TEXT BOOKS	
1.	Vasanth Desai – Fundamentals of Entrepreneurship and Small business management – Himalaya publishing house – 2019
2.	Robert Hisrich, Michael Peters, Dean A. Sheperd, Sabyasachi Sinha – Entrepreneurship - TMH - 2020.
REFERENCE BOOKS	
1.	Vasant Desai – Entrepreneurship Management - Himalaya Publishing House- 2018.
2.	Robert J.Calvin - Entrepreneurial Management – TMH - 2009.
3.	Gurmeet Naroola - The entrepreneurial Connection – TMH - 2009.
4.	ArunaKaulgud - Entrepreneurship Management - Vikas publishing house - 2009.
WEB RESOURCES:	
1	https://nptel.ac.in/courses/110105067/50

Antenna and Wave Propagation

(ECE)

III B. Tech I Semester

Course Category	Professional Core	**Course Code**	20EC5T16
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	EMTL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Study antenna fundamentals, Obtain antenna parameters for wire antenna.
2	Use Principle of Pattern Multiplication for various arrays
3	Study Broad band antennas.
4	Study Reflectors, VHF, UHF and Microwave antennas
5	Understand radio wave propagation.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand antenna fundamentals, Obtain antenna parameters for wire antenna.	K2
CO2	Apply knowledge of Principle of Pattern Multiplication to various arrays	K3
CO3	Apply knowledge of antenna fundamentals to Broad band antennas	K3
CO4	Apply knowledge of antenna fundamentals to Reflectors, VHF, UHF and Microwave antennas	K3
CO5	Infer the characteristics of radio wave propagation in the atmosphere.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1	-	-	-	-	-	-	-	-	-	2	2
CO2	1	1	1	-	-	-	-	-	-	-	-	-	2	1
CO3	2	1	2	1	-	-	1	-	-	-	-	-	2	2
CO4	2	1	2	1	-	-	1	-	-	-	-	-	2	2
CO5	**1**	1	1	1	-	-	-	-	-	-	-	-	2	2

COURSE CONTENT	
UNIT I	**ANTENNA FUNDAMENTALS:** Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height-illustrated Problems. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics.
UNIT II	**THIN LINEAR WIRE ANTENNAS:** Retarded Potentials, Radiation from Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beam widths, Directivity, Effective Area and Effective Height, Small Loops – Characteristics, Comparison of far fields of small loop and short dipole.
UNIT III	**ANTENNA ARRAYS:** 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Derivation of their characteristics and comparison- Illustrative problems Folded Dipoles and their characteristics, Arrays with Parasitic Elements, Yagi-Uda Array, Illustrative problems. **NON-RESONANT RADIATORS:** Introduction, Long wire TWA-patterns, Broadband Antennas: Helical Antennas –Significance, Geometry, basic properties, Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).
UNIT IV	**VHF, UHF AND MICROWAVE ANTENNAS:** Reflector Antennas - Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. Micro strip Antennas-Introduction, Features, Advantages and Limitations. Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications.
UNIT V	**WAVE PROPAGATION:** Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Wave Tilt, Flat and Spherical Earth Considerations. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth‘s Radius, Effect of Earth‘s Curvature, Field Strength Calculations.

TEXT BOOKS	
1.	Antennas for All Applications – John D.Kraus and Ronald J.Marhefka, TMH, 3rd Edition,2003.
2.	Electromagnetic Waves and Radiating Systems – E.C.Jordan and K.G.Balmain,PHI,2nd Edition, 2000.
REFERENCE BOOKS	
1.	Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2.	Antennas and wave propagation- Sisir K Das, Annapurna Das, TMH,2013
3.	Antennas and Wave Propagation, G. S. N. Raju, Pearson Education, 2006.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
III B. Tech I Semester

Course Category	Program Elective	**Course Code**	20EC5T17
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Electronic devices and Circuits, IC Applications	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: The student will study	
1	Different types of electronic measuring instruments‘ working principle, errors, specifications etc
2	Various types of signal generators, wave analyzers and their working principle
3	The working principles of different types of CRO‘s and their applications
4	Working principles of various bridges and the measurement of resistance, inductance, capacitance and frequency.
5	Active and passive transducers and measuring physical parameters using transducers

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	select the instrument for specific measurements and also understand, estimate errors in measurements	K2
CO2	Acquire the knowledge on signal generators and wave analyzers for different applications	K2
CO3	Understand the operation of different oscilloscopes	K2
CO4	Apply the suitable bridge for measurement of resistance, capacitance, inductance and frequency.	K3
CO5	Apply suitable transducer, to measure the physical parameters	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	2	2
CO2	2	2	1	2	1	-	-	-	-	-	-	-	2	2
CO3	3	2	1	2	2	-	-	-	-	-	-	-	2	2
CO4	2	2	1	2	2	-	-	-	-	-	-	-	2	2
CO5	2	1	2	3	3	-	-	-	-	-	-	-	1	2

COURSE CONTENT	
UNIT I	**Performance characteristics of instruments:** Static characteristics, Dynamic Characteristics, Types of errors in measurements and their analysis, Design of multi-range AC, DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter, Digital volt meters (Ramp type, dual slope type, Integrating type, Successive Approximation type), General specifications of DVM
UNIT II	**SIGNAL GENERATORS:** Fixed and variable AF oscillators, AF sine and square wave signal generators, Function Generators, Pulse generator, Random noise generator, Sweep generator, Modern Laboratory signal generator. **Wave Analyzers**: Frequency selective wave analyzer, heterodyne Wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers
UNIT III	**OSCILLO SCOPES:** Basic Principle, CRT features, Vertical amplifiers, Horizontal deflection system, Triggered Sweep CRO, Triggered Pulse Circuit, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Applications of CRO Lissajous method of frequency measurement, standard specifications of oscilloscopes, probes for oscilloscopes- Active and Passive, attenuator type.
UNIT IV	**BRIDGES:** Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance- Schering Bridge, Wien Bridge, Errors and precautions in using bridges, Q-meter, principle of operation, Measurement of impedance and Characteristic impedance using Q-meter
UNIT V	**TRANSDUCERS**: Active and passive transducers - Resistance, Capacitance, Inductance, Strain gauges, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors, LVDT, Temperature transducers, pressure transducers, Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

TEXT BOOKS	
1.	Electronic instrumentation - H.S.Kalsi, 2nd Edition, Tata McGraw Hill, 2004
2.	Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, 5th Edition, PHI, 2002
REFERENCE BOOKS	
1.	Electronic Instrumentation and Measurements - David A. Bell, 2nd Edition PHI, 2003
2.	Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, 2nd Edition, Pearson Education., 2004
3.	Electrical Measurements and Measuring Instruments- R.K.Rajput, S.Chand publications, 2008
WEB RESOURCES	
1.	www.nptel.ac.in/courses/108105064

COMPUTER ARCHITECTURE AND ORGANIZATION
(ECE)
III B. Tech I Semester

Course Category	Professional Core	**Course Code**	20EC5T18
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	STLD	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Discuss the basic concepts and structure of computers &different types ofinstructions
2	Explain different types of addressing modes and architectures
3	Understand the basics of hardwired and micro-programmed control of the CPU, pipelined architectures , Hazards and Superscalar Operations.
4	Estimate the performance of various classes of Memories, build large memories using small memories for better performance
5	Understand various modes of data transfer and multiprocessing systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Examine functional units and instruction set of computer	K3
CO2	Know the different type of Architectures	K4
CO3	Design micro programmed control unit and know the techniques for improving computer performance	K4
CO4	Learn memory systems & its management	K2
CO5	Demonstrate the interfacing of various I/O devices & multi processors	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

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

COURSE CONTENT	
UNIT I	**BASIC STRUCTURE OF COMPUTERS** Structure and function, Designing for performance, Components of a computer system, Arithmetic and Logic Unit **TYPES OF INSTRUCTIONS** Instruction types - Data transfer and manipulation instructions, Arithmetic instructions, Logic instructions, Shift and Rotate instructions, conditional branches with various examples
UNIT II	**CENTRAL PROCESSING UNIT** Instruction formats, Addressing modes, Instruction sequencing, Instruction set architecture design and hardware/software interface, Basic I/O operations &load/store architectures. CISC and RISC architectures. Organization of single- and multi-cycle RISC microprocessors Data path and control logic.
UNIT III	**CONTROL UNIT** Control memory, Address sequencing, computer configuration, microinstructions, micro program sequencing, wide branch addressing, and microinstructions with next-address field. Symbolic microinstructions, symbolic micro program, control unit operations, Design of control unit **TECHNIQUES FOR IMPROVING COMPUTER PERFORMANCE** Pipelining and interleaving, pipelining impact on the ISA and system architecture, speed up achieved through pipelining, pipeline hazards and forwarding, interlocks, and branch delay slots. Parallel processing, RISC pipeline, vector processing and array processing, Super scalar design
UNIT IV	**MEMORY SYSTEMS AND MANAGEMENT** Basic memory circuits, ROM, RAM, EEPROM, Flash Memory, Cache memory, memory hierarchies, Caches- organization, size, implementation and Improve memory performance with caches, mapping functions, interleaving, replacement algorithm, write policy and no of caches. Secondary storage: Magnetic Hard Disk, Optical Disks, Solid State Disks and Arrays, Redundant arrays of inexpensive disks (RAID). Virtualization and sharing computers – Memory management, virtual memory, time sharing and process management
UNIT V	**INPUT/OUTPUT ORGANIZATION AND MULTI PROCESSING SYSTEMS** Peripheral devices, I/O devices/modules –Access, interfaces, asynchronous data transfer, modes of transfer – programmed, interrupt driven and DMA. Interrupt hardware – Enabling and disabling, handling multiple devices, I/O processors, Data communication processor. Buses – Synchronous Bus, Asynchronous bus, Interface Circuits, Standard I/O interface – PCI, USB etc. Multiprocessing systems – Multiprocessor and its characteristics, interconnection structures for multiprocessors, inter processor communication and synchronization

TEXT BOOKS	
1.	Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5/e, McGraw Hill.
2.	Computer System Architecture, M.Morris Mano, 3/e, Pearson/PHI
3.	Computer Organization and Architecture – William Stallings, 6/e, Pearson/PHI
REFERENCE BOOKS	
1.	Structured Computer Organization – Andrew S. Tanenbaum, 4/e, PHI/Pearson
2.	Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition
3.	Computer Organization and Architecture-John P.Hayes, 5th edition, MC GrawHill

Analog ICs and Applications LAB

(ECE)

III B. Tech I Semester

Course Category	Professional Core	**Course Code**	20EC5L06
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Electronics Circuit Analysis	**Internal Assessment Semester** **End Examination** **Total Marks**	25 50 75

COURSE OBJECTIVES	
The student will learn:	
1	the linear and non-linear applications of operational amplifiers (741)
2	familiar with theory and applications of 555 timers.
3	design analog circuits of different applications using PLL and VCO.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	have a thorough understanding of operational amplifier	K2
CO2	to design circuits using operational amplifiers for various applications.	K4
CO3	Demonstrate their knowledge by designing analog circuits	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2		2							2	2	2
CO2	2	1	2		2							2	2	2
CO3	2	2	2		2							2	2	2

List of Experiments to be conducted:

1. Study of ICs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, Parameters and Specifications
2. OP AMP Applications – Inverting amplifier, non-inverting amplifier and voltage follower.
3. Design an Adder, Subtractor using Op-Amp for given specifications
4. Design Inverting and Non-Inverting Comparator using-Amp.
5. Design an Integrator and Differentiator using Op-Amp for given specifications.
6. Design an LPF and HPF (first order) using Op-Amp and obtain its frequency response and bandwidth.
7. Design an Oscillator Circuits – Phase Shift and Wien Bridge Oscillators usingOp-Amp
8. Design a Function Generator using multipleOp-Amp.
9. ADC using IC 0809 & DAC using IC 741 circuits. Using 555 timer.
10. Obtain lock range and capture range for the given Phased Locked Loop IC.
11. Frequency translation using Phased Locked Loop.
12. Design Voltage Controlled Oscillator for given IC and obtain frequency conversionfactor.

Equipment required for Laboratories:

1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components:- IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

(ECE)

III B.Tech, I Semester

Course Category	Lab Course	**Course Code**	20EC5L07
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	EDC	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES: By studying this course the student will learn	
1	various modulation and demodulation techniques of analog modulation
2	verification of pulse modulation techniques
3	the various digital modulation techniques.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze various Analog modulation & demodulation techniques.	K4
CO2	Analyze the performance of pulse modulation techniques	K4
CO3	Interpret the variation in digital modulation techniques like ASK, FSK, PSK etc.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**2**	**-**
CO2	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**-**
CO3	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**2**	**-**

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be conducted

LIST OF EXPERIMENTS (Ten experiments to be done - **The students have to calculate the relevant parameters**) - (a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

1. Amplitude Modulation & Demodulation.
2. AM - DSB SC - Modulation & Demodulation.
3. Diode Detector
4. Frequency Modulation & Demodulation.
5. Verification of Sampling Theorem.
6. Pulse Amplitude Modulation & Demodulation PWM & PPM
7. Verification of Time division multiplexing and demultiplexing.
8. Pulse code modulation and demodulation
9. Delta modulation and demodulation
10. Amplitude shift keying
11. Frequency shift keying
12. Phase shift keying

EQUIPMENTS &SOFTWARE REQUIRED SOFTWARE

i) Computer Systems with latest specifications

ii) Connected in LAN (Optional)

iii) Operating system (Windows 7)

iv) Simulations software (Simulink & MATLAB)

EQUIPMENT

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multimeters
6. Spectrum Analyzer

Soft skills and Interpersonal Communication

Course Category	Humanities	**Course Code**	20HE5S01
Course Type	Skill Oriented Course	**L-T-P-C**	1 – 0 – 2 – 2
Prerequisites	Life skills for better life	**Internal Assessment** **External Assessment (Viva-Voce)** **Total Marks**	15 35 50

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Understand the significance of soft skills and its importance towards his goal setting.
CO2	Develop interpersonal relations through effective communication and public speaking.
CO3	Build confidence exercising verbal and non-verbal techniques with analytical skills for his success.
CO4	Utilize various skills required to become a good leader and thorough professional.
CO5	Improve decision-making skills and problem-solving skills with emotional intelligence.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	2	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	-	1	-	-	-
CO5	-	-	-	-	-	-	2	-	-	-	-	-	-	-

	Syllabus
UNIT - I	1. Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. 2. Self-Discovery:Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. 3. Positivity and Motivation: Developing Positive Thinkingand Attitude; Driving out Negativity; Meaning andTheories of Motivation; Enhancing Motivation Levels.
UNIT-II	1. Interpersonal Communication: Interpersonal relations; communication models,process and barriers; team communication; developing interpersonal relationshipsthrough effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation. 2. Public Speaking:Skills, Methods, Strategies and Essential tips for effective public speaking. 3. Non-Verbal Communication: Importance and Elements; Body Language.
UNIT-III	1. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, OvercomingNervousness. 2. Group Discussion: Importance, Planning, Elements, Skills assessed; effectivelydisagreeing, Initiating, Summarizingand Attaining the Objective. 3. Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. 4. Teamwork and Leadership Skills: Concept of Teams;Building effective teams; Concept of Leadership and honing Leadership skills
UNIT - IV	1. Etiquette and Manners – Social and Business. 2. Time Management – Concept, Essentials, Tips. 3. Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills. 4. Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types ofLeaders; Leadership Behaviour; Assertiveness Skills.
UNIT- V	1. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence 2. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods 3. Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. 4. Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models andImpact of Stress; Measurement and Management of Stress.

Text books :	
1.	Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
2.	English and Soft Skills – S.P.Dhanavel, Orient BlackswanIndia, 2010

WEB RESOURCES	
1.	https://nptel.ac.in/courses/109107121/
2.	https://www.goskills.com/Soft-Skills

MICROPROCESSORS and MICROCONTROLLERS
ECE
III B. Tech II Semester

Course Category	Professional Core	**Course Code**	20EC6T21
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	STLD, CAO	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will	
1	Study architecture and memory organization of 8086.
2	Learn Programming concepts of 8086.
3	Study the interfacing of 8086 with Peripheral devices (I/O devices).
4	Learn the programming concepts of 8051microcontroller.
5	Study architecture and features of ARM Processor and its Applications.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate the concepts of architecture and key features of 8086	K2
CO2	Develop Assembly Language Programs using 8086.	K3
CO3	Understand Interfacing for I/O devices like Stepper motor, LED displays with 8086.	K3
CO4	Understand Interface I/O devices like Keyboard, display units with 8051.	K3
CO5	Illustrate the concepts of ARM Processor in embedded real time project applications.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	-	-	-	-	-	-	-	1	2
CO2	1	2	2	-	-	-	-	-	-	-	-	-	1	2
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	2	1	-	-	-	-	-	-	-	-	1	2	2
CO5	2	1	2	-	-	-	-	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT I	**Introduction:** Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures, 8085 architecture. **8086 ARCHITECTURE:** Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interruptsandinterruptresponses,8086 system timing, minimum mode and maximum mode configurations.
UNIT II	**8086 PROGRAMMING:** Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, writing simple programs with an assembler, assembly language program development tools.
UNIT III	**8086 INTERFACING:** Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display), Intel 8257 DMA controller, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Programmable communication interface 8251-USART, stepper motor, A/D and D/A converters
UNIT IV	**Intel 8051 MICROCONTROLLER:** Architecture, pin descriptions, input/output ports and circuits, memory organization, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.
UNIT V	**ARM Architectures and Processors:** ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces. Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions. ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers‘ model.

TEXT BOOKS	
1.	Advanced Microprocessor and Peripherals, A.K Ray, K.M.Bhurchandhi, Tata McGraw Hill Publications, 2000.
2	The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3	The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.
REFERENCE BOOKS	
1.	Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017
2.	Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
3.	Cortex -M3 Technical Reference Manual.

VLSI Design
ECE
III B. Tech II Semester

Course Category	Professional Core	**Course Code**	20EC6T22
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Digital IC Application and Digital System design	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: This course will help to	
1	enable the student to visualize MOS fabrication technologies and to understand electrical Properties of MOS, CMOS and Bi CMOS circuits.
2	train the student to draw integrated circuit layouts and stick diagrams following Lambda based design rules and to understand basic circuit concepts.
3	know the basic building blocks of Analog IC design
4	study various Combinational and sequential Logic circuit design
5	study the role of FPGA in VLSI design and usage of advanced technologies

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate a clear understanding of CMOS fabrication flow and impact of electrical properties of MOS circuits in semiconductor industry	K2
CO2	Know three sets of design rules with which NMOS and CMOS design may be fabricated by understanding concepts of circuits and scaling of MOS devices	K3
CO3	Design the basic building blocks of Analog IC	K3
CO4	Discuss about the integrated circuit characterization and performance Estimation.	K3
CO5	Understand the importance of FPGA and effect of advanced technology towards performance of VLSI design	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	1	1	1
CO2	1	2	2	-	2	-	-	-	-	-	-	1	2	2
CO3	1	1	1	-	1	-	-	-	-	-	-	1	2	2
CO4	1	1	1	-	1	-	-	-	-	-	-	1	2	2
CO5	1	1	1	-	-	-	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT I	**UNIT-I:INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS:**VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pulldown Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits
UNIT II	**BASIC CIRCUIT CONCEPTS**: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers. **SCALING OF MOS CIRCUITS**: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.
UNIT III	**BASIC BUILDING BLOCKS OF ANALOG IC DESIGN:** Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.
UNIT IV	**CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:** **Static CMOS Design:** Complementary CMOS, Rationed Logic, Pass-Transistor Logic.**Dynamic CMOS Design:** Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, in stability, Meta stability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining.
UNIT V	**FPGA DESIGN:** FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families. **INTRODUCTIONTOADVANCEDTECHNOLOGIES:** Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, Fin-FET, TFET.

TEXT BOOKS	
1.	Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas and A.Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2	Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
3	Digital Integrated Circuits, Jan M.Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2 edition, 2016.
REFERENCE BOOKS	
1.	‒Introduction to VLSI Circuits and Systems‖, John P.Uyemura, John Wiley&Sons, reprint 2009.
2.	Integrated Nano electronics: Nano scale CMOS, Post-CMOS and Allied Nano technologies Vinod Kumar Khanna, Springer India, 1st edition, 2016
3.	Fin-FETs and other multi-gate transistors, Colinge JP, Editor NewYork, Springer, 2008

Digital Signal Processing
ECE
III B. Tech, II Semester

Course Category	PC	**Course Code**	20EC6T23
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Signals & Systems	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES:By studying this course the student will learn	
1.	The importance of discrete-time LTI system and its frequency analysis.
2.	Applications of DFT in filtering and its efficient computation.
3.	Design of IIR filter and its implementation.
4.	Design of FIR filter and its implementation.
5.	Introduction to Multirate and Adaptive signal Processing

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the characteristics of the discrete-time LTI system and the frequency analysis with applications in different filters	K4
CO2	Find the Fourier transform of a discrete-time signal using FFT.	K3
CO3	Different methods to realize the IIR filters with the design.	K3
CO4	Different methods to realize the FIR filters with the design.	K3
CO5	The basic concept of multirate signal processing and adaptive signal processing	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	2	-	-	-	-	-	-	-	2	2	2
CO2	2	2	-	2	-	-	-	-	-	-	-	2	2	2
CO3	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO5	2	2	-	1	-	-	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT I	Review of basic DSP concept. Discrete-time LTI system. Linear Time-Invariant Systems Characterized by Constant-Coefficient Difference EquationsOne-sided z-transform and its properties. Solution to Difference Equations using one-sided z-transform. **Frequency-Domain Analysis of LTI Systems-**Frequency response of LTI systems. Computation of the Frequency Response Function, Ideal Filter Characteristics, low pass, High pass, and Bandpass Filters
UNIT II	**The Discrete Fourier Transform: Its Properties and Applications-** DFT, DFT as a linear transformation, Relationship of DFT to the z-transform, Properties of DFT, Use of DFT in linear filtering, Overlap-Add and Overlap-save method, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.
UNIT III	**REALIZATIONS & DESIGN OF IIR DIGITAL FILTERS:** Basic structures of IIR systems, Direct form I and II, Transposed forms. Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples,
UNIT IV	**REALIZATIONS & DESIGN OF FIR DIGITAL FILTERS:** Basic structures of FIR systems, Lattice structures, Lattice-ladder structures, Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters,
UNIT V	**Multirate Signal Processing-** Interpolation, Decimation, Sampling rate conversion, Digital Filter Banks **Adaptive Signal Processing-**Adaptive Systems, Adaptive Linear Combiner

TEXT BOOKS	
1.	Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education / PHI, 2007.
2.	Multirate Systems and Filter Banks: P.P Vaidyanathan, PHI
3.	Adaptive Signal Processing: Bernard Widrow and Peter N.Stearns, PHI
REFERENCE BOOKS	
1.	Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
2.	Adaptive Filter Theory- Simon S. Hykin
3.	Digital Signal Processing—Tarunkumar Rawat, 1st edition, Oxford, 2015.
WEB RESOURCES	
1.	www.nptelvideos.in/2012/12/digital signal processing.html
2.	https://online.stanford.edu/courses/ee264-digital-signal-processing

MICROWAVE ENGINEERING

III B. Tech II Semester

Course Category	Professional Core	**Course Code**	20EC6T27
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Electromagnetic Waves and Transmission Lines, Antenna Wave and Propagation.	**Internal Assessment Semester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Electromagnetic wave propagation in rectangular wave guide
2	Different microwave junctions and components Scattering matrix of different 2-port, 3-port junctions
3	Classifications of microwave tubes and working principles of klystron tube
4	Classifications of microwave tubes and working principles of solid state devices.
5	Measurement of microwave parameters and fundamentals of HFSS

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Determine dominant modes and cut off frequencies of rectangular wave guides	K2
CO2	Analyze different microwave junctions and components Determine the S-matrix for microwave junctions like E-plane, H-plane and Magic Tee	K3
CO3	Compute power and efficiency of klystron tubes	K2
CO4	Analyze the different Microwave Solid State Devices like Gunn diode, IMPATT and TRAPATT	K2
CO5	Measure microwave parameters like phase, attenuation, impedance, Frequency,VSWR.and learn Basics of HFSS	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	-	-	-	-	-	-	-	-	3	2
CO2	3	2	1	2	-	-	-	-	-	-	-	-	1	2
CO3	3	2	1	1	-	-	1	-	-	-	-	-	1	2
CO4	3	2	1	1	-	-	1	-	-	-	-	-	2	2
CO5	2	1	1	2	-	-	-	-	-	-	-	-	1	2

COURSE CONTENT	
UNIT I	**MICROWAVE TRANSMISSION LINES:** Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides– TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Related problems: Impossibility of TEM mode, Cavity Resonators-Introduction, classification, Rectangular Cavity Resonators.
UNIT II	**WAVEGUIDE COMPONENTS AND APPLICATIONS:** Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities –Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters– Dielectric, Rotary Vane types. **POWER DIVIDERS:** S-matrix analysis of E-Plane Tee, H-Plane Tee, Magic Tee, Multihole directional coupler. Ferrite Components– Faraday Rotation, S-Matrix Calculations for Isolator, Circulator, Related Problems. Introduction to Microstrip lines. Wilkinson power divider and branch line coupler (equal & unequal)
UNIT III	**MICROWAVE TUBES:** Limitations and Losses of conventional tubes at microwave frequencies, Microwave tubes – O type and M type classifications. **O-type tubes**: Two Cavity Klystrons – Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –Expressions for output Power and Efficiency, Reflex Klystrons –Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Related Problems. Introduction to M-type Tubes.
UNIT IV	**MICROWAVE SOLID STATE DEVICES:** Introduction, Classification, Applications. TEDs – Gunn Diode – Principle, RWH Theory, Characteristics. Avalanche Transit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.
UNIT V	**MICROWAVE MEASUREMENTS:** Description of Microwave Bench – Different Blocks and their Features, Precautions, Microwave Power Measurement – Calorimetric Method, Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q, Impedance Measurements. Computational Mechanism tools and its overview, Perfectly Matched Layer (PML), Finite Conductivity Layered Impedance, Impedance Symmetry, Lumped RLC Master/Slave, Screening Impedance.

TEXT BOOKS	
1.	Microwave Devices and Circuits - Samuel Y.Liao, PHI,2009.
2.	Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995
3.	Microwave and Radar Engineering by GottapuSasibhusan Rao, Pearson Publications
REFERENCE BOOKS	
1.	Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2.	Microwave and Radar Engineering-Dr.M. Kulkarni,2nd edition, umesh publications,2008.
3.	Microwave Engineering by Annapurna Das and Sisir Das by Mc Graw Hill
4.	Microwave Engineering by David M Pozar Fourth Edition, Wiley Publications

MOBILE & CELLULAR COMMUNICATION
ECE
III B. Tech, II Semester

Course Category	PE	**Course Code**	20EC6T28
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Antennas and Propagation	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn

1	Cellular communication fundamentals and small cell structure
2	Various types of interferences
3	frequency management techniques and concept of signal reflectors and cell coverage
4	The concept of handoff techniques
5	The Architecture of GSM and OFDM.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand Cellular fundamentals and small cell structure	K2
CO2	Analyze the frequency management	K2
CO3	Analyze the channel assignments to reduce interference and Identify suitable antennas for cell sites	K2
CO4	Apply the concept of handoff to reduce dropped call rates	K2
CO5	Understand the architectures of GSM and OFDM used in network technologies like 3G, 4G etc.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	2	2	-	-	-	-	-	-	-	-	-	2	2	2
CO4	2	-	-	-	-	-	-	-	-	-	-	2	2	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT I	**CELLULAR MOBILE RADIO SYSTEMS**: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems. **CELLULAR CONCEPTS:** Evolution of Cellular systems, Concept of frequency reuse. Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring
UNIT II	**INTERFERENCE:** Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.
UNIT III	**FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:** Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing. **CELL COVERAGE FOR SIGNAL AND TRAFFIC:** Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.
UNIT IV	**HANDOFF STRATEGIES**: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.
UNIT V	**DIGITAL CELLULAR NETWORKS**: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA.3G and 4G Wireless Standards GSM, GPRS, WCDMA , LTE , Wi-MAX, Introduction to 5G standards.

TEXT BOOKS	
1.	Wireless And Cellular Telecommunications- William C. Y. Lee- McGraw Hill, 3rdEdition, 2006
2.	Principles of Mobile Communications – Gordon L. Stuber, Springer International 2 nd Edition, 2007.
REFERENCE BOOKS	
1.	Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edition,2002.
2.	Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley & Sons Publication 2nd Edition
3.	Small Cell Networks: Deployment, PHY Techniques, and Resource Management, Tony Q. S.Quek, G.D.L Roche, Ismail Guvenc, MariosKountouris- Cambridge University Press, 2013

CMOS ANALOG IC DESIGN
ECE
III B.Tech, II Semester

Course Category	Professional Core	**Course Code**	20EC6T29
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	VLSI	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the basic parameters of MOS transistor and different models
2	the basic theory of MOS transistors and Different characteristics
3	Different applications of CMOS transistor
4	the Op-Amps and its application using CMOS transistor
5	the basics theory of open loop comparators.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic parameters of MOS transistor and different models	K3
CO2	Understand the basic theory of MOS transistors and Different characteristics‘	K2
CO3	Study the Different applications of C-MOS transistor	K3
CO4	Design the Op-Amps and its application using C-MOS transistor	K3
CO5	Learn the basics theory of open loop comparators.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1	0	0	0	0	0	0	0	1	2
CO2	2	2	2	2	2	0	0	0	0	0	0	0	2	2
CO3	2	2	2	2	2	0	0	0	0	0	0	0	2	2
CO4	2	2	2	2	1	0	0	0	0	0	0	0	2	2
CO5	2	2	2	2	2	0	0	1	0	0	0	0	2	2

COURSE CONTENT	
UNIT I	MOS Devices and Modeling The MOS Transistor, Passive Components-Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.
UNIT II	Analog CMOS Sub-Circuits MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.
UNIT III	CMOS Amplifiers Inverters, Single Stage Amplifiers –Basic Concepts, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.
UNIT IV	CMOS Operational Amplifiers Design of CMOS Op Amps, Compensation of Op Amps, design of one stage op-Amps, , Power-Supply Rejection Ratio of one-Stage Op Amps ,Design of Two- Stage Op Amps, Power-Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Noise in Op Amps. Stability and Frequency Compensation, Measurement Techniques of OPAMP.
UNIT V	Comparators Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete- Time Comparators.

TEXT BOOKS	
1.	CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010
2.	Analysis and Design of Analog Integrated Circuits- Paul R. Gray, PaulJ. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
REFERENCE BOOKS	
1.	Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edition, 2013.
2.	Design of Analog CMOS Integrated Circuits- BehzadRazavi, TMH Edition.
3.	CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce, PHI
WEB RESOURCES	
https://nptel.ac.in/courses/117/102/117102062/	

Disaster Management
(Open elective)
III B.Tech, II Semester

Course Category	Open elective	**Course Code**	20CE6T35
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	To provide basic conceptual understanding of disasters.
2	To understand approaches of Disaster Management.
3	To build skills to respond to disaster.
4	To understand to reduce the intensity of future disasters.
5	To understand the Restoration of human life in the region.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Knowledge on characteristics of natural disasters	K3
CO2	Planning on approaches of Disaster Management	K2
CO3	Ability to plan and design the new skills in disaster response	K3
CO4	Role of remote sensing system in disaster area response	K3
CO5	Knowledge on the Restoration of human life in the region	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3		1	1					2		3	1
CO2	2	2	3		1	1					2		3	1
CO3	2	2	3		1	1					2		3	1
CO4	2	2	3		1	1					2		3	1
CO5	2	2	3		1	1					2		3	1

COURSE CONTENT	
UNIT I	Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast
UNIT II	Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management
UNIT III	Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses
UNIT IV	Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities- electrical substations- roads and bridges mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS
UNIT V	Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital- Designing resilience- building community capacity for action

TEXT BOOKS	
1.	―Disaster Management guide lines‖, GOI-UND Disaster Risk program (2009-2012)
2.	Modh S. (2010) –Managing Natural Disasters‖, Mac Millan publishers India LTD.
REFERENCE BOOKS	
1.	Murty D.B.N. (2012) ―Disaster Management‖, Deep and Deep Publication PVT.Ltd. New Delhi
WEB RESOURCES	
https://onlinecourses.swayam2.ac.in/cec19_hs20/preview	

Fundamentals of Electric Vehicles

(Open Elective – II offered to other departments)

Course Category	Professional Core Courses	**Course Code**	20EE6T19
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2	To understand various power converters used in electric vehicles.
3	To know various architecture of hybrid electric vehicles.
4	To be familiar all the different types of motors suitable for electric vehicles.
5	To have knowledge on latest developments in strategies and other storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate different types of electric vehicles..	K3
CO2	Select suitable power converters for EV applications.	K2
CO3	Design HEV configuration for a specific application.	K4
CO4	Choose an effective method for EV and HEV applications.	K3
CO5	Analyze a battery management system for EV and HEV	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	-	-	-	-	2	2	-	-	-	-	2	1	1
CO2	2	3	-	-	-	1	1	-	-	-	-	-	2	2
CO3	-	3	-	-	-	1	-	-	-	-	2	2	1	2
CO4	3	2	-	-	-	2	1	-	-	-	2	-	1	2
CO5	2	-	-	-	-	2	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT 1	**Introduction** Fundamentals of vehicles - Components of conventional vehicles - drawbacks of conventional vehicles – Need for electric vehicles - History of Electric Vehicles – Types of Electric Vehicles – Advantages and applications of Electric Vehicles.
UNIT 2	**Components of Electric Vehicles** Main components of Electric Vehicles – Power Converters - Controller and Electric Traction Motor – Rectifiers used in EVs – Bidirectional DC–DC Converters – Voltage Source Inverters – PWM inverters used in EVs.
UNIT 3	**Hybrid Electric Vehicles** Evolution of Hybrid Electric Vehicles – Advantages and Applications of Hybrid Electric Vehicles – Architecture of HEVs - Series and Parallel HEVs – Complex HEVs – Range extended HEVs – Examples - Merits and Demerits.
UNIT 4	**Motors for Electric Vehicles** Characteristics of traction drive - requirements of electric machines for EVs – Different motors suitable for Electric and Hybrid Vehicles – Induction Motors – Synchronous Motors – Permanent Magnetic Synchronous Motors – Brushless DC Motors – Switched Reluctance Motors (Construction details and working only)
UNIT 5	**Energy Sources for Electric Vehicles** Batteries - Types of Batteries – Lithium-ion - Nickel-metal hydride - Lead-acid – Comparison of Batteries - Battery Management System – Ultra capacitors – Flywheels – Fuel Cell – it‘s working.

TEXT BOOKS	
1	Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2021.
2	Denton - Tom. Electric and hybrid vehicles. Rutledge - 2020.
REFERENCE BOOKS	
1	Kumar - L. Ashok - and S. Albert Alexander. Power Converters for Electric Vehicles. CRC Press - 2020.
2	Chau - Kwok Tong. Electric vehicle machines and drives: design - Analysis and Application. John Wiley & Sons - 2015.
3	Berg - Helena. Batteries for electric vehicles: materials and electrochemistry. Cambridge university press - 2015
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108106170
2	https://inverted.in/blog/fundamentals-of-electric-vehicles

Introduction to Automobile Engineering
III B.Tech II Semester
(Open elective)

Course Category	Open elective	**Course Code**	20ME6T25
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	To learn functions of different components in Automobiles
2	To impart knowledge on Transmission systems and Steering Systems.
3	To impart the knowledge on ignition system & suspension systems.
4	To impart the knowledge of Braking system and Engine specification.
5	To understand the concept of safety and Engine emission control systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the function of various components of automobile.	K2
CO2	Identify the merits and demerits of the various transmission and steering systems.	K2
CO3	Describe the concept of Ignition and Suspension systems.	K2
CO4	Explain the features of Braking system and Engine specification.	K3
CO5	Analyze the Engine emission control standards.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	2	2	-	-	-	-	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	1	1	-	2	2	-	-	-	-	-	2	1
CO5	2	2	1	-	-	-	2	-	-	-	-	1	3	-

COURSE CONTENT	
UNIT I	INTRODUCTION: Components of four-wheeler automobile-chassis and body-power unit-types of automobile engines, engine construction, oil filters, oil pumps, air filters, Fuel pump, nozzle, Types of carburetors
UNIT II	TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, Propeller shaft-Hotch-Kiss drive, Torque tube drive, universal joint, differential rear axles-types-wheels and tires. STEERING SYSTEM: Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. steering gears – types, steering linkages.
UNIT III	IGNITION SYSTEM: Function of an ignition system, auto transformer, electronic ignition using contact triggers-spark advance and retard mechanism. SUSPENSION SYSTEM: Objects of suspension systems-rigid axle suspension system, torsion bar, shock absorber, independent suspension system
UNIT IV	BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, pneumatic and vacuum brakes. ENGINE SPECIFICATION: Introduction-engine specifications with regard to power, speed, torque, no. of cylinders and arrangement
UNIT V	SAFETY SYSTEMS: Introduction, safety systems - seat belt, air bags, bumper, wind shield, suspension sensors, traction control, mirrors. ENGINE EMISSION CONTROL: Introduction-types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification.

TEXT BOOKS	
1.	Automotive Mechanics / Heitner.
2.	Automobile Engineering / William Crouse, TMH Distributors.
3.	Automobile Engineering- P.S Gill, S.K. Kataria& Sons, New Delhi.
REFERENCE BOOKS	
1.	Automotive Engines Theory and Servicing, James D. Halderman and Chase D. Mitchell Jr., Pearson education inc.
2.	Automotive Engineering / Newton Steeds & Garrett.
3.	Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Singh, standard publishers.
WEB RESOURCES	
https://nptel.ac.in/courses/107/106/107106080/	

Computer Forensics
CSE, IT, CE, ME, EEE, ECE
III B.Tech II Semester

Course Category	Professional Core	**Course Code**	20CS7T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Identify Security Risks And Take Preventive Steps
2	Understand the Forensics Fundamentals
3	Understand the Evidence Capturing Process

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the Cybercrime Fundamentals	K2
CO2	List the types of attacks on networks	K4
CO3	Analyze various tools available for Cybercrime Investigation	K4
CO4	Summarize the Computer Forensics and Investigation Fundamentals and tools	K2
CO5	Analyze the legal perspectives of Cybercrime	K4

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	2	2	1	0	2	0	0	0	0	2	2
CO2	3	2	2	2	2	1	0	2	0	0	0	0	2	2
CO3	3	2	2	2	2	1	0	2	0	0	0	0	2	2
CO4	3	2	2	2	2	1	0	2	0	0	0	0	2	2
CO5	3	2	2	2	2	1	0	2	0	0	0	0	2	2

COURSE CONTENT	
UNIT I	**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT II	**Tools and Methods :** Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.
UNIT III	**Cyber Crime Investigation:** Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT IV	**Computer Forensics and Investigations:** Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT V	**Cyber Crime Legal Perspectives:** Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act-ITA2000, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime andPunishment, Cyberlaw, Technology and Students: Indian Scenario.

TEXT BOOKS	
1.	Sunit Belapure Nina Godbole –Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives‖, WILEY,First Edition 2011.
2.	Nelson Phillips and Enfinger Steuart, –Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.
REFERENCE BOOKS	
1.	Michael T. Simpson, Kent Backman and James E. Corley, –Hands on Ethical Hacking and Network Defence‖, Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi,First Edition,2015
3.	Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar –Cyber Security and Cyber Laws‖ , Cengage,First Edition,2018.
WEB RESOURCES	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4.	Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

(ECE)

III B. Tech II Semester

Course Category	Professional core	**Course Code**	20EC6L08
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Digital Electronics	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES: By studying this course the student will learn	
1	Assembly language program using MASM and Interfacing
2	Assembly level language program using 8051 and Interfacing
3	assembly level language program using ARM CORTEX M3 Processor using KEIL MDK ARM

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop assembly level language program using MASM and Interfacing	K3
CO2	Develop assembly level language program using 8051 and Interfacing	K3
CO3	Develop assembly level language program using ARM CORTEX M3 Processor using KEIL MDK ARM	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2		2							1	2	2
CO2	1	1	2		1							2	2	2
CO3	1	1	2		2							2	2	2

List of Experiments	
PART- A: 8086 Assembly Language Programming and Interfacing (Minimum Five Experiments Should be Conducted)	
1	Programs for 16 -bit arithmetic operations (using Various Addressing Modes). a. Addition of n-BCD numbers. b. Multiplication and Division operations
2	Program for sorting an array.
3	Program for Factorial of given n-numbers.
4	PPI-Intel8255 Interface using 8086
5	Interfacing ADC to 8086
6	Interfacing DAC to 8086
PART- B: 8051 Assembly Language Programming and Interfacing **(Minimum Five Experiments Should be Conducted)**	
1	Finding number of 1‘s and number of 0‘s in a given 8-bit number
2	Average of n-numbers
3	Ascending/ Descending order
4	Setting and Masking bits in an 8-bit Number
5	Interfacing LCD to8051.
6	Stepper Motor Interfacing Using 8051
PART- C:Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM (Minimum of 2 Experiments has to be performed)	
1	Write an assembly program to multiply of 2 16-bit binary numbers.
2	Write an assembly program to find the sum of first 10 integers numbers.
3	Write a program to toggle LED every second using timer interrupt

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module, DAC module
6. Stepper motor module
7. Key board module
8. LED, 7-SegemtUnits
9. Digital Multi-meters
10. ROM/RAM Interface module
11. Bread Board etc.
12. ARM CORTEX M3
13. KEIL MDKARM, Digital Multi-meters

VLSI Design Lab

ECE

III B. Tech II Semester

Course Category	Professional core	**Course Code**	20EC6L09
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Digital Electronics	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES: To make the students familiarize with the	
1	Design of analog and digital circuits.
2	Usage of EDA tool to simulate, draw schematic and layout, analyze, and test of analog and digital circuits.
3	VHDL and Verilog Codes

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	write VHDL/Verilog code	K3
CO2	use EDA tools to perform simulation, draw schematic and layout, analysis,testing, and interpret results.	K3
CO3	design analog and digital circuits	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	2							1		2
CO2	1	2	1	1	2							1	2	2
CO3	1	2	2	2	2							1	2	2

List of Experiments	
PART (A): FPGA Level Implementation (Any Seven Experiments) **Note 1: The students need to develop Verilog /VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer** **Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory**	
Design and Implementation of the following:	
1	Realization of Logic gates
2	4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modeling
3	a) 16:1 mux through 4:1 mux b) 3:8 decoder realization through 2:4 decoder
4	8:3 encoder
5	8-bit parity generator and checker
6	Flip-Flops
7	8-bit synchronous up-down counter
8	4-bit sequence detector through Mealy and Moore state machines.
EDA Tools/Hardware Required: 1. EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/ Equivalent Industry standard tool along with corresponding FPGA hardware. 2. Desktop computer with appropriate Operating System that supports the EDA tools.	
PART (B): Back-end Level Design and Implementation (Any Five Experiments) **Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.**	
1	a. Universal Gates
	b. An Inverter
2	Full Adder
3	Full Subtractor
4	Decoder
5	D-Flip-flop
EDA Tools/Hardware Required: Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool. Desktop computer with appropriate Operating System that supports the EDA tools.	

DIGITAL SIGNAL PROCESSING LABORATORY

(ECE)

III B Tech II Semester

Course Category	Professional Core	Course Code	20EC6L10
Course Type	Laboratory	L-T-P-C	0-0-3-1.5
Prerequisites	Digital Signal Processing Theory	Internal Assessment Semester End Examination Total Marks	25 50 75

COURSE OBJECTIVES: **To make the students familiarize with the**	
1	Use of MATLAB software in implementing different DSP Algorithms.
2	Use of Python software in implementing different DSP Algorithms.
3	Use of CCS (TI) software in implementing different DSP Algorithms.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		Cognitive Level
CO1	Understand, design, and analyze different DSP techniques using MATLAB software.	K4
CO2	Understand, design, and analyze different DSP techniques using Python software.	K4
CO3	Understand, design, and analyze different DSP techniques using CCS software.	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	-	-	-	-	-	-	-	1	1
CO2	2	2	2	2	2	-	-	-	-	-	-	-	2	1
CO3	2	2	2	2	2	-	-	-	-	-	-	-	2	1

LIST OF EXPERIMENTS: (Total experiment to be concocted is 10)

Using MATLAB (minimum any two)

1. Compute and Compare of linear and circular convolution of two sequences.
2. Compute autocorrelation and cross-correlation of two sequences.
3. Frequency response of a discrete-time system.
4. Implementation of overlap add/overlap save method of linear filtering.
5. Implementing bit reversal.
6. Implementing N-point FFT algorithm and compare the result with DFT.
7. Implementation of LP FIR filters using different windows and compare.
8. Implementation of LP IIR filters using different windows and compare.
9. Implementation of interpolation and decimation process.
10. Implementation of sampling rate conversion.
11. Implementation of any adaptive filter.

Using Python (minimum any two)

1. Compute and Compare of linear and circular convolution of two sequences.
2. Compute autocorrelation and cross-correlation of two sequences.
3. Frequency response of a discrete-time system.
4. Implementation of overlap add/overlap save method of linear filtering.
5. Implementing bit reversal.
6. Implementing N-point FFT algorithm and compare the result with DFT.
7. Implementation of LP FIR filters using different windows and compare.
8. Implementation of LP IIR filters using different windows and compare.
9. Implementation of interpolation and decimation process.
10. Implementation of sampling rate conversion.
11. Implementation of any adaptive filter.

Using CCS (minimum any two)

1. Compute and Compare of linear and circular convolution of two sequences.
2. Compute autocorrelation and cross-correlation of two sequences.
3. Frequency response of a discrete-time system.
4. Implementation of overlap add/overlap save method of linear filtering.
5. Implementing bit reversal.
6. Implementing N-point FFT algorithm and compare the result with DFT.
7. Implementation of LP FIR filters using different windows and compare.
8. Implementation of LP IIR filters using different windows and compare.
9. Implementation of interpolation and decimation process.
10. Implementation of sampling rate conversion.
11. Implementation of any adaptive filter.

ARM / AURDINO BASED PROGRAMMING

(ECE)

III B.Tech II Semester

Course Category	Skill Oriented	**Course Code**	20EC6S03
Course Type	Laboratory	**L-T-P-C**	3-0-0-3
Prerequisites	Embedded Systems	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSEOBJECTIVES: By studying this course the student will	
1	understand fundamentals of Interfacing techniques
2	Know various communication technologies and the connectivity of devices using web and internet in the IoT environment.

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Establish Serial Communication link with Arduino	K2
CO2	Analyze basics of SPI interface	K3
CO3	Interface Stepper Motor with Arduino	K3
CO4	Analyze Accelerometer interface techniques	K2

K1:Remember,K2:Understand,K3:Apply,K4:Analyze,K5:Evaluate,K6:Create.

ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1–Low,2 - Medium,3 –High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	2		2								1	2
CO2	2	2	2		2								2	1
CO3	1	2	2		2								2	2

List of Experiments:

1. Measure Analog signal from Temperature Sensor.
2. Generate PWM output
3. Drive single character generation on Hyper Terminal.
4. Drive a given string on Hyper Terminal
5. Full duplex Link establishment using Hyper terminal.
6. Drive a given value on a 8 bit DAC consisting of SPI
7. Drive Stepper motor using Analog GPIOs
8. Drive Accelerometer and Display the readings on Hyper Terminal

OPTICAL COMMUNICATIONS
(ECE)
IVB. Tech I Semester

Course Category	Professional elective-3	**Course Code**	20EC7T31
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Analog and digital Communication Systems Basics	**Internal Assessment** **Semester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student willunderstand	
1	The Functionality Of Each Of The Fiber Optic Communication System , and Principles Of Single And Multi-Mode Optical Fibers Characteristics
2	The Optical Fiber Properties Of That Affect The Performance Of A Communication Link And Types Of Fiber Materials With Their Properties And The Losses Occur In Fibers.
3	The Working Principle Of Optical Sources And Detectors
4	The Various Methods Of Source To Fiber Power Launching.
5	The Optical Links For Optical Communication System

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To Understand necessary components required in modern optical communications systems, and characteristics of fiber	K2
CO2	To Calculate Power loss based on dispersions and distortions,	K2
CO3	To Analyze the characteristics of various optical sources and detectors.	K3
CO4	To understand optical networks with the help of optical topology..	K2
CO5	To Analyze optical links for analog and digital communication systems	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1							1			1	
CO2	2	1	1							1				
CO3	2	1	1							1				1
CO4	2	1	2							1			1	
CO5	2	2	1							1				2

COURSE CONTENT	
UNIT I	**OVERVIEW OF OPTICAL FIBER COMMUNICATION AND FIBER MATERIALS:** Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems, Glass halide, chalcogenide fibers, plastic optic fibers, active glass fibers.
UNIT II	**OPTICAL FIBER COMPONENTS:** Connector types, Single mode fiber connectors, Connector return loss, Fiber Splices- Fusion Splices, mechanical splices, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints. **LOSES AND DISPERSION:** Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Group delay, Types of Dispersion: - Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, CNR, Related problems.
UNIT III	**OPTICAL SOURCES:** LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED and ILD. **OPTICAL DETECTORS**- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Noise in detection process, Related problems.
UNIT IV	**SOURCE TO FIBER POWER LAUNCHING:** Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Optical network concepts, Topologies, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, Probability of error ,error sources. High performance Optical receivers, Trans Impedance Amplifiers.
UNIT V	**OPTICAL SYSTEM DESIGN:** Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern, Analog links, Introduction to Free–space Optical Communication (FSO).

TEXT BOOKS	
1.	Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.
2.	Optical Fiber Communications – Gerd Keiser, McGraw-Hill International edition, 3rd Edition, 2000.
REFERENCE BOOKS	
1.	Fiber Optic Communications Fundamentals and Applications—shivakumar,M.Jamal Deen, wiley,2014
2.	Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004
3.	Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, PearsonEducation,2005.

DIGITAL IMAGE PROCESSING
ECE
IV **B. Tech**, I **Semester**

Course Category	Program Elective	**Course Code**	20EC7T32
Course Type	Theory	**L-T-P-C**	3-0-0--3
Prerequisites	Signals and Systems, Digital Signal Processing	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will	
1	Learn basic concepts of digital image processing and image transforms.
2	Familiarize with image enhancement methods like spatial and frequency domain filtering methods
3	Familiarize with image restoration techniques.
4	Learn various image compression models and image segmentation fundamentals.
5	Learn the basic concepts of color and morphological image processing

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Perform image manipulations ,different digital image processing techniques and transform techniques	K2
CO2	Understand different image Enhancement techniques in spatial and frequency domain,	K2
CO3	implement algorithms that perform noise removal in images using filtering techniques	K3
CO4	Analyze different coding techniques for image compression and understand the concepts of segmentation methods.	K4
CO5	Understand the concepts of colour and morphological image processing algorithms.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	-	1	2	-	-	-	-	-	1	1	1
CO2	2	2	1	-	2	2	-	-	-	-	-	-	2	-
CO3	2	1	1	2	2	1	-	-	-	-	-	-	1	1
CO4	2	2	2	1	2	1	-	-	-	-	-	-	1	1
CO5	2	1	1	2	1	1	-	-	-	-	-	-	1	2

COURSE CONTENT	
UNIT I	**Introduction:** Evolution of Digital image processing, Examples of fields that use digital image processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing. **Image Transforms:** Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Discrete Cosine transform, Haar Transform, Slant transform, KL Transform, SVD Transform, Comparison of different image transforms.
UNIT II	**Image Enhancement in Spatial domain & Frequency Domain:** Need for Image Enhancement, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters , sharpening spatial filters, Combining spatial enhancement methods. The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering
UNIT III	**Image Restoration :** A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter
UNIT IV	**Image Compression**: Need for image compression, Huffman coding, Arithmetic coding, LZW coding, Run-length coding, Bit Plane coding, Block Transform coding, Predictive coding (lossless and lossy),sub band coding, Wavelet coding. Image standards (JPEG, MPEG, GIF). **Image Segmentation**: Fundamentals, Point, Line and Edge detection, Region based segmentation, Edge detection, Edge linking, Thresholding.
UNIT V	**Morphological Image Processing:** Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale Morphology, Segmentation using morphological watersheds. **Color image processing:** color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS	
1.	R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2.	Jayaraman, S. Esakkirajan, and T. Veerakumar,‖ Digital Image Processing‖, Tata McGraw-Hill Education, 2011
REFERENCE BOOKS	
1.	Anil K.Jain, ―Fundamentals of Digital Image Processing‖, Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2.	B.Chanda, D.DuttaMajumder, –Digital Image Processing and Analysis‖, PHI, 2009
3.	S.Sridhar,‖Digital Image Processing‖. Oxford university press ,2011

Low Power VLSI Design
ECE
IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	20EC7T33
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	VLSI Design	**Internal Assessment** **Semester End Examination** **Total Marks**	30M 70M 100M

COURSE OBJECTIVES: By studying this course the student will learn	
1	the sources of power dissipation
2	the scaling of device parameters
3	the bus-encoding, clock-gating and FSM power minimization
4	the techniques to reduce the leakage power
5	the low power clock distribution analysis and simulation analysis

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand sources of power dissipation	K2
CO2	Understand the scaling of device parameters	K2
CO3	Understand bus-encoding, clock-gating and FSM power minimization	K2
CO4	Understand the techniques to reduce the leakage power	K2
CO5	Understand the low power clock distribution analysis and simulation analysis	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	-	-	-	-	-	-	-	-	2	2	2
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	2	2

COURSE CONTENT	
UNIT I	**Sources of Power Dissipation**: Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Sub threshold Leakage Current, Short-Channel Effects
UNIT II	**Supply Voltage Scaling for Low Power Device**: Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling
UNIT III	**Probabilistic Power Analysis:** Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy **Switched Capacitance Minimization:** Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs, FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization
UNIT IV	**Leakage Power Minimization**: Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management
UNIT V	**Low power clock distribution& Simulation Power Analysis**: Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, zero skew versus tolerable skew, chip and package co design for clock network. **Simulation Power Analysis**: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS	
1.	Low power design methodologies- Massoud Pedram, Jan M. Rabaey, Kluwer Academic Publishers
2.	Low-Power VLSI Circuits and Systems, Ajit Pal, 2015, SPRINGER PUBLISHERS
REFERENCE BOOKS	
1.	Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
2.	Practical Low Power Digital VLSI Design, Gary Yeap from Motorola, SPRINGER SCIENCE+BUSINESS MEDIA, LLC..
3.	Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

SATELLITE COMMUNICATION
(ECE)
IV B. Tech I Semester

Course Category	Professional elective	**Course Code**	**20EC7T34**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Digital Communications	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the basic concepts, applications, frequencies used in satellite communications
2	the various satellite subsystems and its functionality.
3	the concepts of satellite link design and calculation of C/N ratio. and to understand the concepts of the transmitters, receivers, antennas, tracking systems of satellite
4	the concepts of multiple access and various types of multiple access techniques in satellite systems
5	Know the concepts of satellite navigation, architecture and applications of GPS and know the various applications of satellites.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To Understand the basic principles of satellite systems.	K2
CO2	To Analyze Satellite subsystems.	K2
CO3	To Design the link budget of a satellite for specified C/N ratios. Know the concepts of satellite earth station technologies	K3
CO4	To understand Configure the satellite multiple access techniques.	K2
CO5	To develop the satellite navigation and GPS and understand the applications of satellites.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1							1			1	
CO2	2	1	1							1				
CO3	2	1	1							1				1
CO4	2	1	2							1			1	
CO5	2	2	1							1				2

COURSE CONTENT	
UNIT I	**INTRODUCTION:** Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications. **ORBITAL MECHANICS AND LAUNCHERS**: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.
UNIT II	**SATELLITE SUBSYSTEMS:** Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification
UNIT III	**SATELLITE LINK DESIGN:** Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example. **EARTH STATION TECHNOLOGY:** Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods. **Low earth orbit and geo-stationary satellite systems:** Orbit consideration, coverage and frequency considerations, Delay and Throughput considerations, System considerations, Operational NGSO constellation Designs.
UNIT IV	**MULTIPLE ACCESS:** Frequency division multiple access (FDMA) Intermediation, Calculation of C/N, Time division Multiple Access (TDMA), Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception, PN Sequence, Direct Sequence and Frequency Hopped Spread Spectrum System.
UNIT V	**SATELLITE NAVIGATION AND THE GLOBAL POSITIONING SYSTEM**: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS. SATELLITE APPLICATIONS: INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV (BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

TEXT BOOKS	
1.	Satellite Communications Engineering – Wilbur L.Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.
2.	Satellite communication -- Pratt and Bostian, John Wiley and Sons, 2007
REFERENCE BOOKS	
1.	Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2.	Bruce R. Elbert, ‒Satellite Communication Applications‖, Hand Book, Artech House Bostan London, 1997
3.	Satellite Communication concepts and applications N.Raja Rao , 2nd edition
WEB RESOURCES	
1.	https://nptel.ac.in/courses/117/105/117105131/

Embedded Systems

(ECE)

IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	20EC7T35
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	1.C Programming 2.Microprocessors and Microcontrollers	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the basics of Embedded System and demonstrate real time applications
2	a physical model of an Application by studying all hardware components required and Develop software program for a simple Embedded Application
3	The basic concepts of RTOS
4	an Embedded System by learning hardware and Software Co-Design Approaches
5	the basic concepts of Robotics.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Embedded System and demonstrate real time applications	K2
CO2	Build a physical model of an Application by studying all hardware components required and Develop software program for a simple Embedded Application	K3
CO3	Outline basic concepts of RTOS	K2
CO4	Develop an Embedded System by learning hardware and Software Co-Design Approaches	K5
CO5	Summarize the basic concepts of Robotics.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2											1	1
CO2	1	2	2										1	1
CO3	1	2											1	1
CO4	2	2											1	1
CO5	2	2											1	1

COURSE CONTENT	
UNIT I	**Embedded Systems Introduction:** Embedded System Definition, Embedded System Vs General Purpose Computing System, Classification& Characteristics of Embedded Systems, Embedded System Block Diagram, Real time Examples of Application Specific (Washing Machine, Digital camera) & Domain Specific (Automotive vehicle) Embedded Systems.
UNIT II	**Embedded Hardware & Firmware Design Hardware Design**: Analog & Digital Electronic Components, Serial Communication Devices (I2C, SPI,CAN), Embedded System Design flow. **Software Design**: Embedded Firmware Design approaches, Development Languages, ISR Concept, Interrupt Service Mechanism, Basic concepts Embedded C and Sample programs
UNIT III	**Real Time Operating System :** Operating System Basics, Types of OS, Kernel Architecture, Tasks, process and Threads, Task Scheduling, Threads, Process Scheduling, Task Communication & Synchronization, Examples of handheld & Real time Operating systems.
UNIT IV	**Hardware Software Co-Design & Testing:** Fundamental Issues in Hardware Software Co-Design, Hardware Software Trade-offs, Integration of Hardware & Firmware. **Testing:** The main software utility tool, Translation tools-Pre- processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools
UNIT V	**Introduction to Robotics:** Definition and origin of robotics, Classification & generation of Robots, General Block diagram of robot, sensors and actuators - IR Sensors, Ultrasonic sensors, Vision devices (Kinect sensor), Accelerometers, Electrical, Hydraulic Actuators.

TEXT BOOKS	
1.	Introduction to Embedded Systems, Shibu K V, TMH Education.
2.	Introduction to Robotics, Phillip McKerrow, Wesley Publishing Company,1991
	Architecture, Programming and Design, 2nd Edition, Raj Kamal, 2009
REFERENCE BOOKS	
1.	Embedded and Real time applications , KVKK Prasad, Dreamtech press2005
2.	Introduction to Robotics, John J.Craig ,,Pearson, 2009
3.	Embedded System Design A unified Hardware/Software Introduction, Frank Vahid/Tony Givargis, John Wiley &Sons,Inc.
WEB RESOURCES	
1.	http://nptel.ac.in/courses/117103063

Digital IC Design using CMOS
ECE
IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	20EC7T36
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites	DICA ,VLSI	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	about static and dynamic characteristics of MOS Inverters.
2	the design of combinational logic gates in CMOS.
3	Sequential logic circuits design in CMOS.
4	the design of basic Arithmetic building blocks.
5	the concept of semiconductor memories.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concepts of MOS Design	K2
CO2	Design and analysis of Combinational MOS Circuits.	K4
CO3	Design and analysis of Sequential MOS Circuits.	K4
CO4	Extend the Digital IC Design to Different Applications.	K2
CO5	Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	1	-	-	2	-	-	-	-	-	-	-	1	2
CO2	2	2	2	-	2	2	-	2	-	-	-	-	1	2
CO3	2	2	2	-	2	2	-	2	-	-	-	-	1	2
CO4	-	1	-	-	-	1	-	-	-	-	-	-	1	2
CO5	2	2	2	-	-	-	-	2	-	-	-	-	1	2

COURSE CONTENT	
UNIT I	**MOS Design**: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.
UNIT II	**Combinational MOS Logic Circuits**: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.
UNIT III	**Sequential MOS Logic Circuits**: Behavior of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.
UNIT IV	**Dynamic Logic Circuits**: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.
UNIT V	**Interconnect:** Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques. **Semiconductor Memories**: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

TEXT BOOKS	
1.	Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan, BorivojeNikolic, 2nd Ed., PHI.
2.	Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
REFERENCE BOOKS	
1.	CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2.	CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson
3.	Introduction to VLSI Systems: A Logic, Circuit and System Perspective, Ming - BO Lin, CRC Press, 2011.
WEB RESOURCES	
1.	https://subodhtripathi.files.wordpress.com/2012/01/0072460539cmos1.pdf
2.	highered.mheducation.com/sites/0072460539/index.html
3.	https://www.slideshare.net/.../105926921-cmos digital integrated circuits solution manual.

RADAR ENGINEERING
(ECE)
IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	20EC7T37
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	EMTL, MWE	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	The Basic Principle of radar and radar range equation.
2	Different types of radars; CW, FM-CW.
3	MTI and pulse Doppler radars performance, different tracking techniques for radar
4	The characteristics of a matched filter receiver and its performance.
5	Different types of displays, duplexers and antennas used in radar systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Familiarize the fundamentals of basic radar.	K2
CO2	Doppler Effect to detect moving targets.	K1
CO3	Analyze the MTI radar performance and radar tracking methods.	K4
CO4	Apply the concepts of matched filter and ambiguity functions in detection of radar signals in noise.	K4
CO5	Design radar receiver based on characteristics of duplexer and antennas	K1

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	-	1	-	-	-	-	-	1	1	1
CO2	2	2	2	1	-	2	-	-	-	-	-	1	1	1
CO3	2	2	2	1	-	2	-	-	-	-	-	1	1	1
CO4	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	2	2	2	1	-	2	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT I	**BASICS OF RADAR:** Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems. Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses(qualitative treatment), Illustrative Problems
UNITII	**CW AND FREQUENCY MODULATED RADAR :** Doppler Effect, CW Radar– Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problem. FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar
UNITIII	**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, Nth Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar. TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two-coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.
UNITIV	DETECTION OF RADAR SIGNALS IN NOISE : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross- correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.
UNITV	RADAR RECEIVERS: Duplexers – Branch type and Balanced type, Circulators as Duplexers, Radar Displays. PHASED ARRAY RADAR -Introduction to Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes.

TEXT BOOKS	
1.	Introduction to Radar Systems -M.I. Skolnik, 2nd Edition, McGraw Hill Book,1981.
2.	Understanding of RADAR Systems - Simon Kingsley and Shaun Quegan, , McGraw Hill Book, 1993.
REFERENCE BOOKS	
1.	Radar Engineering and Fundamentals of Navigational Aids -G S N Raju, IK International Publishers, 2008.
2.	Microwave and Radar Engineering, G.SasiBhushana Rao,Pearson education, 2013
3.	Fundamental of Microwave & Radar Engineering By K. K. Sharma · 2011
WEB RESOURCES	
1.	https://nptel.ac.in/courses/108/105/108105154/

INTERNET OF THINGS
ECE
IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	**20EC7T38**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Electronics and Devices Circuits, Embedded systems, wireless sensor Networks.	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES:	
CO1	To introduce the terminology, technology and its applications
CO2	To Implement Data and Knowledge Management and use of Devices in IoT Technology
CO3	To introduce the concept of M2M (machine to machine) with necessary protocols
CO4	To classify Real World IoT Design Constraints, Industrial Automation in IoT.
CO5	To introduce the Raspberry PI platform, that is widely used in IoT applications
CO1	To introduce the Python Scripting Language which is used in many IoT devices

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the building blocks of Internet of Things and characteristics	K1
CO2	Appraise the role of IoT protocols for efficient network communication. Elaborate the need for Data Analytics and Security in IoT	K2
CO3	Realize the difference between M2M and IOT. Explain IOT physical devices.	K3
CO4	Analyze the domain specific applications of IoT	K4
CO5	Develop Internet of Things & Logical Design using Python. Develop real life IoT based projects	K5

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1							1		2	2
CO2	2	2	2	2							1		2	2
CO3	2	2	2	1							1		2	2
CO4	2	2	1	2							1		2	2
CO5	2	2	2	2							1		2	1

COURSE CONTENT	
UNIT I	Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates
UNIT II	Machine to Machine, Difference between IoT and M2M, SDN and NFV for IOT, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER
UNIT III	What is an IOT Device, Exemplary Device: Arduino IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP
UNIT IV	Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle Industry applications, Surveillance applications,
UNIT V	Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date / Time Operations, Classes, Python Packages of interest for IOT

TEXT BOOKS	
1.	Internet of Things (A Hands-on-Approach), Vijay Madisetti and Arshdeep Bahga, 1 st Edition, VPT, 2014. (ISBN: 978-8173719547)
2.	Internet of Things, Srinivasa K.G., Siddesh, G.M., Hanumantha Raju R. Cengage Publications, 1st Edition 2018
REFERENCE BOOKS	
1.	Internet of Things: Architecture and Design Principles, Raj Kamal, 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224
2.	Designing the Internet of Things, Adrian McEwen, 1stEdition, Wiley Publishers, 2014
3.	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
4	Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress
WEB RESOURCES	
1.	https://www.coursera.org/specializations/internet-of-things
2.	https://www.class-central.com/tag/internet%20of%20things
3.	https://www.businessinsider.com/internet-of-things-devices-applications-examples-2016-8?IR=T

Pattern Recognition and Machine Learning
ECE
IV B. Tech I Semester

Course Category	Professional Elective	**Course Code**	20EC7T39
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce the mathematical, statistical and theoretically about the Pattern Recognition
2	To introduce the students to the basic concepts and methods for the recognition of patterns in data
3	To provide the student with a working knowledge of pattern recognition application development process
4	Apply different algorithmic approaches for the detection and characterization of patterns in multi-dimensional data
5	Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Collect and critically interpret relevant information to design a simple pattern recognition system	K1
CO2	Identify the strengths and weaknesses of different pattern classification techniques	K5
CO3	Implement different pattern classifiers. Apply various dimensionality reduction methods for feature selection or feature extraction.	K3
CO4	Apply pattern recognition techniques to real-world problems	K5
CO5	Evaluate the result from a simple pattern recognition system	K6

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	-	-	-							2	-	-
CO3	2	-	-	-	2	-	-	-	2	-	-	-	2	-
CO4	2	2	2	-	2	2	-	-	2	-	2	-	2	2
CO5	-	2	-	2	2	-	-	-	-	-	-	-	2	-

COURSE CONTENT	
UNIT I	**Introduction to Pattern Recognition:** Problem, applications, design cycle, learning and adaption, examples, Probability Distributions, Parametric Learning – Maximum likelihood and Bayesian Decision Theory- Bays rule, Discriminate functions, loss functions and Bayesian error analysis
UNIT II	**Linear models:** Linear Models for Regression, Linear regression, logistic regression Linear Models for Classification
UNIT III	**Neural Network:** Perceptron, multilayer, Back Propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods- Gradient descent, Newton method, Conjugate gradient, Quasi-Newton method, and Levenberg Marquardt algorithm
UNIT IV	**Linear discriminate functions** -Decision surfaces, two-category, minimum-squared error procedures, the Ho kashyap procedures, linear programming algorithms, support vector machine
UNIT V	**Algorithm independent machine learning –** Lack of internet superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers **Unsupervised learning and clustering**- k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS	
1.	Pattern Classification, Richard O. Duda, Peter E. Hart, David G. Stock ,2nd Edition John Wiley & Sons, 2001
2.	Machine Learning by SaikatDutt, S. ChandramouliandA.K.Das, Pearson publication,2018
REFERENCE BOOKS	
1.	Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, ‒The Elements of Statistical Learning‖, 2nd Edition, Springer,2009.
2.	C. Bishop, ‒Pattern Recognition and Machine Learning‖, Springer,2006
3.	S. Rajasekharan and G.A. Vijayalakshmipai ‒Neural Networks Fuzzy Logic and genetic Algorithms‖.
WEB RESOURCES	
1.	http://www.neuraldesigner.com
2.	http://www.scincedirect.com
3.	https://nptel.ac.in/courses/106/106/106106046/

Highway Engineering
(Open Elective)
IV B. Tech I Semester

Course Category	Open Elective	**Course Code**	20CE7T11
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce the students with the principles and practice of transportation engineering which focuses on Highway Engineering.
2	Ability to mathematically develop and interpret design standards for horizontal and vertical geometry and super elevation
3	To provide basic knowledge on materials used in pavement construction.
4	To enable the students to have a strong analytical and practical knowledge of Planning, Designing of Pavements.
5	To provide basic knowledge in traffic engineering, and transportation planning.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Plan highway network for a given area.	K1
CO2	Design the Highway geometrics based on highway alignment.	K5
CO3	Characterize the pavement materials like aggregates, Bituminous materials &construction.	K3
CO4	Judge suitability of pavement materials and design flexible and rigid pavements.	K5
CO5	Design Intersections and prepare traffic management plans	K6

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	1												1	
CO2	1	3	2	1									1	
CO3	1		1											
CO4	1	2	2	1									1	2
CO5	1												1	

COURSE CONTENT	
UNIT I	Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.
UNIT II	Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment- Gradients- Vertical curves.
UNIT III	Highway Materials: Sub-grade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties -Tests on Bitumen .
UNIT IV	Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements. Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.
UNIT V	Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density-Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC method.

TEXT BOOKS	
1.	Highway Engineering‘ by Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi.
2.	Highway Engineering‘ by Khanna S.K., Justo C.E.G and Veeraragavan A, Nem Chand Bros, Roorkee.
REFERENCE BOOKS	
1.	Transportation Engineering and Planning‘ by Papacostas C.S. and PD Prevedouros, Prentice Hall of India Pvt. Ltd; New Delhi.
2.	_Highway Engineering‘ by Srinivasa Kumar R, Universities Press, Hyderabad
WEB RESOURCES	
1.	https://nptel.ac.in/downloads/105101087/

Battery Management Systems and Charging Stations

(Open Elective – III offered to other departments)

Course Category	Professional Core Courses	**Course Code**	20EE7T29
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To discuss about the different types of batteries.
2	To describe about the battery characteristic & parameters.
3	To apply the concepts of battery management system and design the battery pack.
4	To explain about the battery testing, disposal and recycling.
5	To describe different methods of EV charging

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Discuss about the different types of batteries.	K2
CO2	Describe about the battery characteristic & parameters.	K2
CO3	Apply the concepts of battery management system and design the battery pack.	K3
CO4	Explain about the battery testing, disposal and recycling.	K2
CO5	Describe different methods of EV charging	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	-	-	-	-	-	-	-	-	-	-	1	1	1
CO3	2	1	1	-	1	1	1	-	-	-	-	1	1	1
CO4	2	-	-	-	1	1	1	-	-	-	-	1	1	1
CO5	2	-	-	-	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT 1	**Batteries** Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zinc Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System Suggested reading: Study of different types of batteries

UNIT 2	**Battery Characteristics & Parameters** Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance.
UNIT 3	**Battery Pack and Battery Management System** Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests
UNIT 4	**Battery Testing, Disposal & Recycling** Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, Short circuits, charging and discharging. Environment and Human Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries.
UNIT 5	**Charging Stations** Electric Vehicle Technology and Charging Equipment‘s, Basic charging Block Diagram of Charger, Difference between Slow charger and fast charger, Slow charger design rating, Fast charger design rating, AC charging and DC charging, Inboard and off board charger specification, Type of Mode of charger Mode -2, Mode-3 and Mode-4, EVSE associated charge times calculation.

TEXT BOOKS	
1	Guangjin Zhao, ‒Reuse and Recycling of Lithium-Ion Power Batteries‖, John Wiley & Sons. 2017. (ISBN: 978-1-1193-2185-9)
2	Arno Kwade, Jan Diekmann, ‒Recycling of Lithium-Ion Batteries: The LithoRec Way‖, Springer, 2018. (ISBN: 978-3-319-70571-2)
REFERENCE BOOKS	
1	Ibrahim Dinçer, Halil S. Hamut and Nader Javani, ―Thermal Management of Electric Vehicle Battery Systems‖, John Wiley& Sons Ltd., 2016.
2	Chris Mi, Abul Masrur & David Wenzhong Gao, ‒Hybrid electric Vehicle- Principles & Applications with Practical Properties‖, Wiley, 2011.
3	G. Pistoia, J.P. Wiaux, S.P. Wolsky, ‒Used Battery Collection and Recycling‖, Elsevier, 2001. (ISBN: 0-444-50562-8)‖
4	T R Crompton, ‒Battery Reference Book-3 rd Edition‖, Newnes- Reed Educational and Professional Publishing Ltd., 2000.
5	James Larminie, John Lowry, ‒Electric Vehicle Technology Explained‖, John Wiley & Sons Ltd, 2003.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108106170
2	https://www.youtube.com/watch?v=omnQN5Z5vsA

IV Year I Semester
ADDITIVE MANUFACTURING
(for CE, EEE, ECE, CSE, CSE(AIML), CSE(AI), CSE(DS), IT)

Course Category	Open Elective	**Course Code**	20ME7T28
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
Students will learn	
1	Fundamentals of rapid prototyping and concepts of liquid-based rapid prototyping systems
2	Concepts of solid-based rapid prototyping systems
3	Concepts of powder-based rapid prototyping systems
4	Different rapid tooling processes
5	Rapid prototyping data formats and applications of additive manufacturing in various industries

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the rapid prototyping fundamentals & choose different liquid based rapid prototyping processes for manufacturing	K2
CO2	Choose different solid based rapid prototyping processes for manufacturing	K2
CO3	Choose different powder based rapid prototyping processes for manufacturing	K2
CO4	Choose different rapid tooling processes for prototyping manufacturing	K2
CO5	Elaborate the uses of additive manufacturing processes in various industries.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO2	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO3	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-

COURSE CONTENT

UNIT I

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Photopolymers, photo polymerization, layering technology, laser and laser scanning. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT II

SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modelling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT III

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three-dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies

UNIT IV

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT V

ENHANCING ADDITIVE MANUFACTURING WITH REVERSE ENGINEERING: Reverse engineering, uses of reverse engineering, Steps for reverse engineering in additive manufacturing, 3D scanning techniques.

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis.

TEXT BOOKS

1. Chua C.K., Leong K.F., and Lim C.S., –Rapid prototyping: Principles and applications‖, Third Edition, World Scientific Publishers, 2010.
2. Gebhardt A., –Rapid prototyping‖, Hanser Gardener Publications, 2003

REFERENCE BOOKS

1. Liou L.W. and Liou F.W., –Rapid Prototyping and Engineering applications: A tool box for prototype development‖, CRC Press, 2007.
2. Kamrani A.K. and Nasr E.A., –Rapid Prototyping: Theory and practice‖, Springer, 2006.
3. Hilton P.D. and Jacobs P.F., –Rapid Tooling: Technologies and Industrial Applications‖, CRC press, 2000.

WEB RESOURCES

1. nptel.ac.in/courses/112104204/47
2. nptel.ac.in/courses/112107078/37
3. https://www.youtube.com/watch?v=kNz-TM4zPkE&list=PLbTLRuAivTCR0YVCNxSTPI9lgccanmZLG
4. https://lecturenotes.in/m/46059-note-of-additive-manufacturing-by-madhura-diwakar?reading=true
5. https://www.slideshare.net/badebhau/additive-manufacturing-processes-pdf-by-badebhau4gmailcom

Big Data Analytics

(Common to CSE, IT, CSE(AI&ML), CSE(AI), CSE(DS))
(Open Elective – III for CIVIL, EEE, MECH, ECE)

Course Category	Professional Core	**Course Code**	**20DS6T02**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Mining	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSEOBJECTIVES	
1	To optimize business decisions and create competitive advantage with Big Data analytics
2	To learn to analyze the big data using intelligent techniques
3	To introduce programming tools PIG & HIVE in Hadoop echo system

COURSEOUTCOMES **Upon successful completion of the course, thes tudent will be able to:**		**Cognitive level**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine	K2
CO2	Enumerate and apply the features of Cassandra	K2
CO3	Design and develop Hadoop and Map Reduce programs	K3
CO4	Perform data analysis using Apache Spark	K2
CO5	Analyze the data analytics process with a case study	K3

K1:Remember,K2:Understand,K3:Apply,K4:Analyze,K5:Evaluate,K6:Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1–Low,2-Medium,3– High)

CO	**PO**												**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2	2	-	-	-	-	-	-	-	1	1	1
2	3	1	1	2	2	-	-	-	-	-	-	1	-	-	1
3	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1
4	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1
5	3	3	3	2	2	-	-	-	-	-	-	1	2	2	1

COURSECONTENT	
UNITI	**Types of Digital Data:** Classification of Digital Data. Introduction to Big Data: Characteristic of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is BigData? **Big Data Analytics:** Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Classification of Analytics, Terminologies Used in Big Data Environments. TheBig Data Technology Landscape: NoSQL.**(Text Book 1)**
UNITII	**Introduction to Cassandra:** Apache Cassandra – An Introduction, Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD, Collections, Using a Counter, Time to Live, Alter Commands, Import and Export.**(Text Book 1)**
UNITIII	**Hadoop**: Hadoop Overview, HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator). **MAPREDUCE:** Introduction to MAPREDUCE Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.**(Text Book 1)**
UNITIV	**Introduction to Data Analysis with Spark**: What is Apache Spark,A unified Spark, Who uses Spark and for what?, A Brief Historyof Spark, Spark version and releases, Storage layers for Spark. **Programming with RDDs:** RDD Basics, Creating RDDs, RDDOperations, Passing functions to Spark, Common Transformationsand Actions, Persistence.**(Text Book 2)**
UNITV	**JasperReport using Jaspersoft:** Introduction to Jasper Reports, Connecting to MongoDB NoSQL Database, Connecting to Cassandra NoSQL Database. **Few Interesting Differences:** Difference between Data Warehouse and Data Lake, Difference between RDBMS and HDFS, Difference between HDFS and HBase, Difference between Hadoop Map Reduce and Spark, Difference between Pig and Hive**(Text Book 1)**

TEXTBOOKS	
1.	Big Data and Analytics by Seema Acharya, Subhashini Chellappan, Second Edition, Wiley India Pvt. Ltd., 2019
2.	Learning Spark: Lightning-Fast Big Data Analysis by Andy Konwinski, Holden Karau, Matei Zaharia, Patrick Wendell, First Edition, O'Reilly, 2015

REFERENCEBOOKS	
1.	Big Data Analytics, by Radha Shankarmani, M Vijayalakshmi, Second Edition, Wiley India Pvt. Ltd., 2016
2.	Bill Franks, –Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, John Wiley& sons, 2012.
3.	Hadoop: The Definitive Guideby Tom White, O'Reilly Media, Inc., 2009
4.	Bart Baesens, –Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)‖, John Wiley & Sons, 2014.

WEBRESOURCES	
1.	http://hadoop.apache.org/
2.	https://nptel.ac.in/courses/106104189/
3.	https://www.edx.org/course/big-data-fundamentals
4.	https://www.coursera.org/specializations/big-data
5.	https://www.wileyindia.com/big-data-and-analytics-2ed.html

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Organizational Behavior
(Open Elective)
IV B. Tech I Semester

Course Category	Open Elective	**Course Code**	20HM7T09
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the meaning and importance of Organizational Behaviour to start and survive in corporate environment.	K2
CO2	Demonstrate how the perception can integrate in human behaviour , attitudes and values.	K2
CO3	Understand the importance of Groups and Teams in organizations for better Decision making.	K2
CO4	Understand the need for change and its importance in organizations.	K2
CO5	Understand the culture of organizations and to apply techniques in dealing with stress in organizations.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1						1		2	2	2		2	1	
CO2						1		3	2	3		2	1	
CO3						1		2	3	3		2		
CO4						1		3	3	2		2	1	2
CO5						3		1	2	2		2	1	

COURSE CONTENT	
UNIT I	**Introduction to Organizational Behaviour** Concept-Nature and scope-Importance of Organizational Behaviour-Key elements of Organizational Behaviour-Role of managers in Organizational Behaviour-Approaches to Organizational Behaviour-Perspectives of Human Behaviour-Challenges and Opportunities for Organizational Behaviour.
UNIT II	**Perceptual Management** Nature-Process of Perception- Organization and Interpretation-Influencing factors-Importance of Perception in OB - Perceptual Errors- Attitudes and Values – Changes and Behaviour Modification Techniques-Impression Management.
UNIT III	**Introduction to Groups and Teams** Meaning –Importance of Groups - Foundations of Group Behaviour –Reasons for Group formation-Group and Team-Types of Groups-Stages of Group development –Meaning and Importance of Teams- Factors affecting Group and Team performance-Types of teams-Creating an effective Team.
UNIT IV	**Organization Change and Development** Definition and Meaning - Need for change-Forces for changes in Organization-Types of change-Organizational Resistance-Strategies overcome Resistance-Process of change-Meaning and Definition of Organization Development-OD interventions.
UNIT V	**Organizational Culture and Organizational Stress** Organizational culture: Meaning and Nature of Organizational Culture-Functions-Types-Creating and maintain Organizational Culture-Managing Cultural Diversity. Organizational Stress: Definition and Meaning-Sources of stress-Impact of stress on organizations-Stress Management Techniques.

TEXT BOOKS	
1.	K.Aswathappa: ‒Organizational Behaviour-Text, Cases and Games‖, Himalaya Publishing House, New Delhi, 2017,
2.	Stephen P. Robbins, Timothy, A. Judge: ‒Essentials of Organizational Behaviour‖ Pearson,2017
3.	Pareek Udai, Sushma Khanna: ‒Understanding Organizational Behaviour‖, Oxford University Press, New Delhi, 2016.
REFERENCE BOOKS	
1.	Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2015
2.	Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: ‒Organizational Behavior‖, Tata McGraw Hill Education, New Delhi, 2017.
3	Jerald Greenberg and Robert A Baron: ‒Behavior in Organizations‖, PHI Learning Private Limited, New Delhi, 2013.
4	Jai B.P.Sinha: ‒Culture and Organizational Behavior‖, Sage Publication India Private Limited, New Delhi, 2009.
5	New strom W. John& Davis Keith, Organisational Behaviour--Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
WEB RESOURCES	
1.	https://www.diversityresources.com/cultural-diversity-workplace/
2	https://www.chanty.com/blog/problem-solving-techniques/
3	https://www.simplypsychology.org/perspective.html#:~:text=The%20five%20major%20perspectives%20in,%2C%20behavioral%2C%20cognitive%20and%20humanistic

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Water Resource Engineering
(Open Elective)
IV B. Tech I Semester

Course Category	Open Elective	**Course Code**	20CE7T13
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce hydrologic cycle and its relevance to Civil engineering.
2	Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
3	Appreciate concepts and theory of physical processes and interactions.
4	Learn measurement and estimation of the components hydrologic cycle.
5	Provide an overview and understanding of Unit Hydrograph theory and its analysis.
6	Understand flood frequency analysis, design flood, flood routing.
7	Appreciate the concepts of groundwater movement and well hydraulics
8	Learn overview of flood routing and its effects.
9	Has to be understood and identify the flood occurring areas nearby.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the theories and principles governing the hydrologic processes and list out the forms of precipitation in real conditions.	K1
CO2	Apply key concepts to several practical areas of engineering hydrology and related design aspects.	K5
CO3	Design major hydrologic components for a need-based structures.	K3
CO4	Estimate flood magnitude and carry out flood routing.	K5
CO5	Demonstrate the recuperation test process in open wells.	K6

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	3	2	2	2	2	2					1		1	
CO2	3	2	2	2	2	2					1		1	
CO3	3	2	2	2	2	2					1		1	
CO4	3	2	2	2	2	2					1		1	
CO5	3	2	2	2	1	2					1		1	

COURSE CONTENT	
UNIT I	INTRODUCTION: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, Frequency of point rainfall, Rain fall data in India. Intensity-Duration-Frequency (IDF) curves, Depth-Area Duration (DAD) curves,

	Probable Maximum Precipitation (PMP), design storm, problems on average rainfall on towns
UNIT II	ABSTRACTIONS FROM PRECIPITATION: Introduction, Initial abstractions. EVAPORATION: Factors affecting, measurement, reduction, Analytical methods of Evaporation estimation. EVAPOTRANSPIRATION: Factors affecting, measurement, control, Potential Evapotranspiration over India. INFILTRATION: Factors affecting, Infiltration capacity curve, measurement, Infiltration Indices. Problems on ϕ-Index and W-Index.
UNIT III	RUNOFF: Catchment characteristics, Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. HYDROGRAPH ANALYSIS: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S- hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph. Problems on unit hydrograph.
UNIT IV	FLOODS: Causes and effects, frequency analysis - Gumbel‘s and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management, Design flood, Design storm. FLOOD ROUTING: Hydrologic storage routing, channel and reservoir routing- Muskingum and Puls methods of routing, flood control in India. ADVANCED TOPICS IN HYDROLOGY: Rainfall-Runoff Modelling, Instantaneous Unit Hydrograph (IUH) - Conceptual models - Clark and Nash models, general hydrological models- Chow - Kulandaiswamy model.
UNIT V	GROUNDWATER: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, specific capacity, permeability, transitivity and storage coefficient, types of wells, well loss, Darcy‘s law, Dupuit‘s equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

TEXT BOOKS	
1.	Engineering Hydrology‟ by Subramanya, K, Tata McGraw-Hill Education Pvt. Ltd, (2013), NewDelhi.
2.	Engineering Hydrology‟ by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi.
3	–Irrigation and Water Power Engineering‖ by Punmia B C, P.B.B Lal, A.K. Jainand A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi.
REFERENCE BOOKS	
1.	Water Resources Engineering‘ Mays L.W, Wiley India Pvt. Ltd, (2013).
2.	_Hydrology‘ by Raghunath. H.M. New Age International Publishers,(2010).
3	_Engineering Hydrology –Principles and Practice‘ by Ponce V.M., Prentice Hall International,(1994).
4	_Hydrology and Water Resources Engineering‘ by Patra K.C., Narosa Publications,(2011).
5	_Applied hydrology‘ by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt.Ltd., Transportation Engineering-Id., (2011), NewDelhi.
6	_Engineering Hydrology‘ by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press,(2010).

Smart Grid Technologies

(Open Elective – IV offered to other departments)

Course Category	Professional Core Courses	**Course Code**	20EE7T30
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand the basic concepts of smart grid.
2	To understand various smart grid technologies and its usage in smart applications.
3	To realize substation automation with intelligent sensors and have an idea on battery energy storage systems.
4	To have basic knowledge on micro grids and DG‘s.
5	To have an idea on communication technologies used in smart grid.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the concepts of smart grids and analyze the smart grid policies and developments in smart grids.	K2
CO2	Analyze the concepts of smart grid technologies in hybrid electrical vehicles etc.	K4
CO3	Know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.	K2
CO4	Analyze micro grids and distributed generation systems.	K4
CO5	Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	1	1	1	1	1	-	-	-	-	1	2	2
CO2	3	2	1	1	1	1	1	-	-	-	-	1	2	2
CO3	3	2	1	1	1	1	1	-	-	-	-	1	2	2
CO4	3	2	1	1	1	1	1	-	-	-	-	1	2	2
CO5	3	2	1	1	1	1	1	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT 1	**Introduction to Smart Grid** Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid - Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid.
UNIT 2	**Smart Grid Technologies-1** Introduction to Smart Meters - Real Time Pricing - Smart Appliances - Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers - Net Metering.
UNIT 3	**Smart Grid Technologies- 2** Smart Substations - Substation Automation - Feeder Automation. Geographic Information System(GIS) - Intelligent Electronic Devices (IED) & their application for monitoring & protection. Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES)
UNIT 4	**Micro grids and Distributed Energy Resources** Concept of micro grid - need & applications of microgrid - formation of microgrid - Issues of interconnection - protection & control of microgrid - Integration of renewable energy sources - Demand Response.
UNIT 5	**Information and Communication Technology for Smart Grid** Advanced Metering Infrastructure (AMI) - Home Area Network (HAN) - Neighborhood Area Network (NAN) - Wide Area Network (WAN).

TEXT BOOKS	
1	Integration of Green and Renewable Energy in Electric Power Systems - by Ali Keyhani - Mohammad N. Marwali - Min Dai Wiley - 2009.
2	The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W.Gellings - Fairmont Press - 2009.
REFERENCE BOOKS	
1	The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - John Cooper - Artech House Publishers July 2011
2	Control and Automation of Electric Power Distribution Systems (Power Engineering) by James Northcote - Green - Robert G. Wilson - CRC Press - 2017.
3	Substation Automation (Power Electronics and Power Systems) by MladenKezunovic - Mark G. Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert - Springer - 2010.
4	Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - Surya Santoso -H. Wayne Beaty - McGraw Hill Publication - 2nd Edition.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108107113
2	https://electrical-engineering-portal.com/smart-grid-concept-and-characteristics

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Sustainable Energy Technologies
(Open Elective)
IV B. Tech I Semester

Course Category	Open Elective	**Course Code**	20ME7T38
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To demonstrate the importance and solar radiation, solar energy collection and storage
2	To understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy
3	To interpret energy efficient electrical and mechanical systems
4	To develop energy efficient processes
5	To understand features and benefits of green buildings

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the importance and solar radiation, solar energy collection and storage.	K2
CO2	Understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy.	K2
CO3	Analyze energy efficient electrical and mechanical systems.	K2
CO4	Understand features and benefits of green buildings.	K2
CO5	Understand the different types of unconventional machining methods and principles of finishing processes.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO2	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO3	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO4	3	2	3	-	3	-	-	-	3	-	3	-	-	2
CO5	3	2	3	-	3	-	-	-	3	-	3	-	-	2

COURSE CONTENT	
UNIT I	**SOLAR RADIATION**: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells. **SOLAR ENERGY COLLECTION**: Flat plate and concentrating collectors,

	classification of concentrating collectors, orientation. **SOLAR ENERGY STORAGE AND APPLICATIONS**: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.
UNIT II	**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement. **BIO-MASS**: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects. **GEOTHERMAL ENERGY**: Resources, types of wells, methods of harnessing the energy. **OCEAN ENERGY**: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.
UNIT III	**ENERGY EFFICIENT SYSTEMS:** **ELECTRICAL SYSTEMS**: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management. **MECHANICAL SYSTEMS**: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, environmentally friendly and Energy efficient compressors and pumps**.**
UNIT IV	**ENERGY EFFICIENT PROCESSES:** Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmentally friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing..
UNIT V	**GREEN BUILDINGS:** Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmentally friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

TEXT BOOKS	
1.	Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2.	Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3	Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013
REFERENCE BOOKS	
1.	Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international
2.	Principles of Solar Engineering - D.YogiGoswami, Frank Krieth & John F Kreider/Taylor & Francis
3	Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
4	Renewable Energy Technologies -Ramesh & Kumar /Narosa
5	Non conventional Energy Source- G.D Roy/Standard Publishers
6	Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt. Ltd

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CRYPTOGRAPHY AND NETWORK SECURITY
Open Elective)
IV B. Tech I Semester

Course Category	Professional Core	**Course Code**	20IT6T10
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES
The objective of the course is to

1	The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Explain different security threats and countermeasures and foundation course of cryptography mathematics.	K1
CO2	Classifythebasicprinciplesofsymmetrickeyalgorithmsandoperationsof somesymmetrickeyalgorithmsandasymmetrickeycryptography	K2
CO3	RevisethebasicprinciplesofPublickeyalgorithmsandWorkingoperation sofsomeAsymmetrickeyalgorithmssuchasRSA,ECCandsomemore	K2
CO4	Design applications of hash algorithms, digital signatures and key management techniques	K3
CO5	DeterminetheknowledgeofApplicationlayer,TransportlayerandNetwo rklayersecurityProtocolssuchasPGP,S/MIME,SSL,TSL,andIPsec	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	1	2	-	-	-	-	-	-	-	-	2
CO2	3	2	3	1	2	-	-	-	-	-	-	-	2	2
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	2
CO4	3	2	3	3	3	-	-	-	-	-	-	-	1	1
CO5	3	2	3	3	3	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT I	Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.
UNIT II	Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.
UNIT III	**Asymmetric Encryption:** Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography
UNIT IV	**Data Integrity, Digital Signature Schemes & Key Management:** Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.
UNIT V	**Network Security-I:** Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security-II :** Security at the Network Layer: IPSec, System Security

TEXT BOOKS	
1.	Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2.	Cryptography and Network Security,4thEdition, William Stallings, (6e) Pearson,2006
3.	Everyday Cryptography, 1stEdition, Keith M.Martin, Oxford,2016

REFERENCE BOOKS	
1.	Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018.

Marketing Management
(Open Elective)
IV B. Tech I Semester

Course Category	Open Elective	**Course Code**	20HM7T04
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites	Humanities including Management	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concepts of Marketing and Marketing Environment.	K2
CO2	Analyze the consumer behavior and market segmentation in order to maintain better consumer relations and product positioning respectively.	K3
CO3	Make use of strategies and make decisions based on product life cycle and product mix concepts.	K4
CO4	Understand the pricing effects and select a better distribution channel to reach the consumer.	K2
CO5	Understand the promotional methods and importance.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1			2			1	1	1		1	1		1	
CO2			1			1		2	1		1		1	
CO3			1	2	1	2	1	1			1	1		
CO4			1			1		1			1		1	2
CO5						1	1	1	1	1	1	1	1	

COURSE CONTENT	
UNIT I	**Introduction to Marketing**: Market and Marketing, Functions, importance and problems of marketing – Marketing Environment, Approaches to the study of marketing – Institutional Approach, Commodity approach, Management approach, systems approach to marketing. Marketing Mix(7 p's of Marketing.)
UNIT II	**Consumer Behavior and CRM** Meaning and features and Factors influencing Consumer Behavior – Theories of Buying Behavior (Economic theories – Marshallion model, psychological theories, psycho-analytic theories, socio-cultural theories) – buying decision process - Customer Relationship Management. **Market Segmentation** Market Segmentation – Bases of Segmenting Consumer Market and Industrial Market – Target Marketing – Product differentiation – Product Positioning.
UNIT III	**Product decision**: New product development – Product mix – management of product life cycle – product strategies – product additions and deletions. Branding, packaging and labeling – product differentiation – planned obsolescence.
UNIT IV	**Pricing:** Pricing objectives – Pricing methods – Pricing strategies. **Channels of Distribution:** Nature and types of marketing channels – wholesale distribution- retail distribution – direct marketing – selection of channels, Logistics, Third Party Service providers..
UNIT V	**Promotion :** Nature and Importance of promotion – promotional methods of personal selling : objectives and function, Advertising objectives – Message content – media selection – Advertising agency – Advertising Budgets – Measuring Advertising effectiveness; Sales promotion Techniques – Social Media Promotion

TEXT BOOKS	
1.	Phil T.Kotler –Marketing Management - Pearson Education limited – 2019
2.	S.A.Sherlekar – Marketing Management - Himalaya Publishing House - 2019
3	Dr. K.Karunakaran – Marketing Management Himalaya Publishing House – 2010.
REFERENCE BOOKS	
1.	Priyanka Goel - Marketing Management – Atlantic publications - 2019.
2.	Philip Kotler and Lane Keller - Marketing Management – Pearson Educaion ltd - 2017
3	L.Natarajan – Marketing Management – Margham Publications - 2012
WEB RESOURCES	
1.	https://www.tutorialspoint.com/marketing_management/marketing_management_functions
2	https://keydifferences.com/difference-between-branding-and-packaging.html
3	https://smallbusiness.chron.com/product-mix-639.html

Universal Human Values-II Understanding Harmony

IV B. Tech I Semester

Course Category	Humanities Science	Course Code	20HM7T11
Course Type	Theory	**L-T-P-C**	3- 0- 0 - 3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K2
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K1
CO3	Understand the role of a human being in ensuring harmony in society and nature.	K2
CO4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	K1
CO5	Understand the current scenario in Technology with respect to the Professional Ethics	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1						3		3				3		
CO2						3		3	3					
CO3						3		3	3					
CO4						3		3	3					
CO5						3		3	3					

COURSE CONTENT	
UNIT I	**Introduction to Value Education:** Value Education, Definition, Concept and Need for Value Education, Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education..
UNIT II	**Harmony in the Human Being:** Human Being is more than just the Body, Harmony of the Self (_I‘) with the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.
UNIT III	**Harmony in the Family and Society and Harmony in the Nature:** Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today‘s Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence..
UNIT IV	**Social Ethics:**The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities..
UNIT V	**Professional Ethics:** Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario, Vision for Holistic Technologies, Production System and Management Models.

TEXT BOOKS	
1.	A.N Tripathy, New Age International Publishers, 2003.
2.	Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3	Bertrand Russell Human Society in Ethics & Politics
REFERENCE BOOKS	
1.	Corliss Lamont, Philosophy of Humanism
2.	Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3	Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books, 2009.
4	.I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5	Mortimer. J. Adler, – Whatman has made of man
6	William Lilly Introduction to Ethic Allied Publisher
WEB RESOURCES	
1.	https://www.tandfonline.com/doi/abs/10.2753/RSP1061-1967330482?journalCode=mrsp20
2	https://www.thefbcg.com/resource/building-family-harmony-starts-with-living-our-values/#:~:text=What%20does%20family%20harmony%20mean,family%20as%20a%20larger%20unit

Designer Tools

(HFSS, Microwave Studio CST. Cadence Virtuoso. Synopsys, Mentor Graphics Xilinx)

IV B. Tech I Semester

Course Category	SOC	Course Code	20EC7S04
Course Type		**L-T-P-C**	1- 0- 2 - 2
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the usage of different high end EDA tools	K3
CO2	Program and experiment analog and digital based real time problems	K4
CO3	Solve problem related to advanced areas	K5

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	2	1	1	2	2							3		
CO2	1	2		2	2									
CO3	2	2	1	1	2									