RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

Affiliated to JNTUA-Ananthapuramu, Approved by AICTE-New Delhi,
Accredited by NBA-New Delhi, Accredited by NAAC with A+ Grade-New Delhi
Nandyal – 518501, AP, India

DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

Regulations, Course Structure and Detailed Syllabus

RGM-R-2020

(ESTD-1995)

Applicable for students admitted into
B.Tech (Regular) from 2020-2021
B.Tech (Lateral Entry Scheme) from 2021-22

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

B.Tech. (Regular) from 2020-21 and B.Tech. (Lateral Entry Scheme) from 2021-22

For pursuing four year Bachelor Degree Program (under graduate) of study in Engineering (B.Tech.), Two-year Master (post graduate) Degree of study in Engineering (M.Tech), Two year Master (post graduate) degree of study in Business Administration (MBA), Two year Master (post graduate) Degree of study in Computer Applications (MCA) offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal - 518501 under Autonomous status and herein referred to as RGMCET (Autonomous).

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2020-21 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Rajeev Gandhi Memorial College of Engineering and Technology shall be the Chairman, Academic Council.

The candidate seeking admission into the first year of study of four year B.Tech degree Program should have:

i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination certified by Board of Intermediate Education) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or any equivalent examination certified by State Board of Technical Education) for admission.

ii) Secured a rank in the EAMCET/EAPCET

iii) examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET/EAPCET, for admission.

Admission Procedure:

As per the norms of A.P. State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made to the first year of Four year B.Tech. Degree program as follows:

a) As per the norms of Government of Andhra Pradesh, A-Category (based on the rank obtained in EAMCET/EAPCET) seats will be filled by the Convener, EAMCET/EAPCET.

b) As per the norms of Government of Andhra Pradesh, B-Category seats will be filled by the management.

Admission to the Second year of Four year B.Tech. Degree Program in Engineering:

i) Candidates qualified in ECET and admitted by the Convener, ECET, in such cases for admission, when needed permission from the statutory bodies is to be obtained.

ii) 10% of the sanctioned strength in each program of study (of RGMCET) shall be filled by the Convener, ECET as lateral entry.

List of Programs offered

1. B.Tech – Regular & Lateral Entry
2. M.Tech – Regular
3. MBA – Regular
4. MCA – Regular

Academic Regulations for 2020-21 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2020-2021)

The B.Tech. Degree be conferred by the Jawaharlal Nehru Technological University Anantapur, Anantapuramu, students who are admitted to the program and fulfill all the requirements for the award of the Degree as specified below:

1.0 Award of B.Tech. Degree

1.1. The student will be declared eligible for the award of the B. Tech. degree if he fulfils the following academic regulations:

1.2. Pursued a course of study for not less than prescribed course work duration and not more than double the prescribed course work duration.

1.3. Registered for 160 credits and secured 160 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

S.No	Subject Particulars		
1	All the subjects offered in B.Tech course / MOOCs	7	Technical Seminar
2	**Mandatory Learning Courses** [Environmental Science, Environmental Engineering, Universal Human Values, Indian Heritage and Culture, Constitution of India, Induction Program, Essence of Indian Traditional Knowledge]	8	2 Months Internships - Two
3	All Practical Subjects	9	6 Month Internship
4	All Skill Oriented Courses /Skill Advanced Courses/ Soft Skill Courses	10	Main Project Work
5	Comprehensive Viva	11	Universal Human Values as 03 credits course with effective from 2021 admitted students.
6	Environmental Sciences/ Universal Human Values/ Environmental Engineering/ Indian Heritage and Culture/ Constitution of India/ Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses.		

2.0 Forfeit of seat

Students, who fail to fulfill all the academic requirements for the award of the degree within **eight academic years** from the year of their admission, shall forfeit their seat in B.Tech. Course.

3.0 Courses of study

The following courses of study are offered at present as specializations for the B.Tech. Course: and any other course as approved by the authorities of the University from time to time.

1) **Civil Engineering**
2) **Electrical and Electronics Engineering**
3) **Mechanical Engineering**
4) **Electronics and Communication Engineering**
5) **Computer Science and Engineering**
6) **Computer Science and Engineering (Data Science)**
7) **Computer Science and Engineering and Business Systems**

Table 2: Credits

Subject	Semester			
	Periods/ Week	Credits	Internal Marks (IM)	External Marks (EM)
Theory	2+1*	3	30	70
Mandatory Learning Courses (Internal Evaluation)	2	-	-	-
Practical	3	1.5	25	50
Drawing	1+4 P	3	30	70
Skill Development Courses (Internal Evaluation)	1+2*	2**	30	70
Summer Internship /CSP Two months (Mandatory) after second year (to be evaluated along with 5th Semester end examinations)/ Community Service Project (Internal Evaluation)	-	1.5	-	100 Certificate from Internship Agency/ signed by any authorized person. Evaluation will be carried as per the guidelines of APSCHE
Industrial/Research Internship Two months (Mandatory) after third year (to be evaluated along with 7th Semester end examinations)	-	3	-	100 Certificate from Internship Agency Evaluation will be carried as per the guidelines of APSCHE ***40% for report, 60% Oral Presentation***
Comprehensive Viva (CV) in VII Semester	-	1	-	50
Major Project	-	6	50	100
Technical Seminar	-	1	50	-
6 Months Internship in Industry	-	5	-	Certificate from Internship Agency/ Industry

Note: * Tutorial

Note: ** [Skill Development Course/ Mandatory Learning Course credits will not be considered for the award of division. However, all these courses have to be cleared through internal evaluation by scoring minimum of 40% marks. The credits obtained in Skill development courses will be taken in to account for the award of degree]

Note: - EAA will not carry any credits but attendance requirements of 75% should be fulfilled otherwise they have to reregister to fulfill academic requirements.

4.0 Distribution and Weightage of Marks

4.1. The performance of the student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 75 marks for practical subject. Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 100 marks.

4.2. For theory subjects, the distribution shall be 30 marks for Internal Evaluation (20 marks for internal test and 10 marks for assignment or field work/group task / online test) and 70 marks for the End-Examination.

4.3. During the semester there shall be 2 tests for theory subjects. In each Internal test there shall be one compulsory (short answers) question and 3 descriptive questions are to be answered. The duration of internal test will be for 2 hours. First test to be conducted in 3 units and second test to be conducted in the remaining 3 units of each subject. For awarding of 20 Internal marks the performance of the student in two Internal examinations conducted one in the middle of the semester and the other towards the end of the semester giving a weight age of 0.75 for the better score and 0.25 for the other score will be considered. There shall be two assignments (***only online submission of Assignments will be accepted***) in each subject (problem based/ field work/group task/Online test) for award of 10 marks so that internal Component (marks) will be 30 marks (20 marks for internal test+10 marks for assignments / field work/group task). ***Out of these two internal tests one internal test for 20 marks will be conducted in online mode.***

Table 3: Units for Internal Tests

Semester	
3 Units - First Internal test	3 Units - Second Internal test

4.4. In the case of Skill Development Courses/ Mandatory Learning courses, two Internal examinations shall be conducted one in the middle of the semester and the other at the end of the semester for 30 marks and the marks scored by the student in these exams with a weight age of 0.75 for better score and 0.25 for the other score will be awarded as Internal marks for 30. For the remaining 70 marks an end examination will be conducted along with other theory examinations. However, skill development

courses/Value added courses/ Mandatory Learning Courses, end examination will be evaluated internally.

4.5. No makeup test for internal examination or assignments/group tasks will be conducted in any subject or practical. The student, who is absent for any test shall be deemed to have scored zero marks in that subject.

4.6. Open and Professional Electives will commence from 3rd year first semester onwards. The open elective offered in 3-1 semester will be based on self-study/MOOCs. All the students have to opt for the MOOCs (Self Study) and should acquire the required credits. If the student fails to opt for MOOCs, (Under unavoidable circumstances) he/she has to write two internal tests besides the end examination conducted by the institute (Elective offered in place of MOOCs by the Dept.) like other subjects. However, he/she has to obtain the certificate from the organization in which he has registered. Any MOOCs course selected by the student should be of more than 45 hours duration / 12 weeks course with a minimum of 3 credits and also from the reputed organization. Attendance of the student who has opted for MOOCs will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to the next semester. Attendance will not be recorded for MOOCs.

{Massive open online Courses (MOOCs') B.Tech students can avail the facility of earning up to a maximum of 5% credits of their degree requirements through MOOCs. MOOC courses eligible for this purpose are the courses offered by NPTEL / SWAYAM / EDX / Course by any other reputed organisation approved by the department only. The student shall obtain prior approval of the Head of the Department before registering for MOOC's. MOOC courses can be taken in lieu of Elective courses such as Open Electives & Professional Electives (pertaining to their branch only) and Employability Enhancement Courses. No Core, Lab or Project Course can be dropped in lieu of MOOC. The student shall submit course Title, institute which offered MOOC, Examination system and Credits of the Course, duration of course. After deciding on the MOOC and a course which is approved as its equivalent in the curriculum a student can enrol for it and clear it any time as per his/her convenience and obtain the assessment certificate.

If the assessment certificate is submitted

i) Before the commencement of the semester in which the equivalent course is offered, the student will be exempted from attending the regular class work and internal assessment exams of the equivalent subject.

ii) During the semester the student is permitted to withdraw from the remaining part of the course work and internal assessment tests.

iii) After the semester is over but before the results of that semester are declared the student can request for considering his performance in the MOOC in lieu of its equivalent.

The student shall submit to the HOD the original certificate issued by MOOC authorities along with a photocopy of the same. The original will be returned after verification and verification shall be certified by the Head of the Department on the photocopy which shall be kept in records. An equivalent Grade corresponding to grade/marks awarded by MOOC agency shall be determined by a committee consisting of Principal, Controller of Examinations, Dean Student affairs and HOD concerned. This equivalent Grade shall be shown in the grade sheet and accounted in the SGPA and CGPA calculations.

4.7. Gap Year – Concept of student Entrepreneur in Residence shall be introduced and the 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 full time entrepreneurship. This period may be extended for another one year (two years in total) and this period would not be counted for the maximum duration for completion of graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and committee shall decide on permitting the student for having the Gap Year. The committee consists of Principal as Chairman and all HODs as members.

4.8. In the open electives offered from III year I Sem onwards student has to select the subjects among the list of open elective subjects by the other departments (inter - department). Student has to clear the subject as per norms to get the required credits. At least minimum of 40 students should register for any open elective; otherwise, that open elective will not be offered.

4.9. Out of the professional electives offered from III Year I Semester onwards again one Professional elective in IV Year I Sem will be a MOOCs (Self Study) and the student has to acquire the required credits to clear the subject as specified in 4.6.

4.10. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept. / Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

4.11. All undergraduate students shall register for Extra - Academic Activity (EAA) such as

a) NCC/NSS

b) Games and Sports

c) Yoga/Meditation

d) Extension Activities

e) Literary/ Cultural Activities

f) Any other which may be offered in future.

A student will be required to participate in an activity for two hours in a week during second and third semesters. The activities shall be carried out in the allotted hours. The activities will be monitored by the respective faculty in charge, senior faculty member of the department and the Department HOD. Grades will be awarded on the basis of participation, attendance, performance and behaviour. Grades shall be entered in the marks statement as **Good**, **Satisfactory** and **Unsatisfactory** and shall not be counted towards CGPA calculation. If any student gets an Unsatisfactory Grade, he / she has to repeat the activity in the immediate subsequent Semester / year.

4.12. Courses like Environmental Sciences, 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 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. **Universal Human Values course** shall be included in the curriculum as credit course in place of any open elective as per the convenience of department.

4.13. Students shall undergo **two mandatory summer internships for a minimum of two months** duration at the end of **second and third** year of the Programme. There shall also be **mandatory 6 months internship** in the **final semester** of the Programme along with the project work and seminar.

4.14. **Curricular Framework for Skill oriented**

i) For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

iii) A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/ Professional bodies /APSSDC or any other accredited bodies as approved by the concerned BoS.

v) The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

vi) If a student chooses to take a Certificate Course offered by industries/ Professional bodies/ APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

viii) A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

4.15. **Curricular Framework for Honours Programme**

i) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

ii) A student shall be permitted to register for Honors program at the beginning of 4^{th} semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2^{nd} semester without any backlogs. In case of the declaration of the 3^{rd} semester results after the commencement of the 4^{th} semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced

courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv) In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

v) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

vi) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

viii) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

ix) MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x) The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

xi) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will

be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

4.16. **Curricular Framework for Minor Programme:**

i) **a)** Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IoT track, Machine learning track etc.

ii) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iii) The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

iv) There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

v) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

vi) A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point

average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

vii) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

viii) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

ix) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

x) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xi) A committee should be formed at the level of College/Universities/department to evaluate the Grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xii) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree

certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xiii) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiv) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

INDUSTRIAL COLLABORATIONS (CASE STUDY)

University-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Universities/Institutions (Autonomous) are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Universities/Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities/Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

4.17. All the students have to undergo three mandatory internships namely

i) Summer internship / CSP (During 2nd year break)

ii) Industrial/ Research internship (During 3rd year break)

iii) 6 Months internship in industry (During 8th Semester)

The student has to (mandatory) undergo summer internship in II year–II Sem break in a reputed organization for two months. The finalization of the internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the summer internship will be evaluated during the 5th semester which carries 1.5 credits. The student has to undergo research/ industry internship in III year –II Semester break for a period of two months in a reputed organization. The finalization of the summer

internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. The student has to undergo 6 months internship in IV Year, II Semester for a complete period of 6 months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HOD and Internship in charge to the academic section before the commencement of 3-2 semester.

4.18. The medium of instruction for all Course work, Examination, Seminar Presentations, Project Reports and all academic activities shall be English.

5.0 Question Paper Pattern

5.1. Each Internal Test question paper shall contain 5 questions, of which the First question is compulsory and three questions are to be answered from the remaining four. Compulsory question carries 5 marks (It contains 5 questions of one marks - no choice in first question). The remaining 3 questions carry 5 marks each. Each question shall have a,b,c.... parts.

5.2. The End Examination question paper will have 7 questions and students have to answer 5 questions. However, the first question is compulsory and it consists of 7 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 14 marks. Each 14 marks question shall have a, b, c .. parts. Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the principal. A minimum of 50% of subjects will be evaluated by external examiners.

5.3. For practical subjects, there shall be a continuous evaluation during the semester for 25 internal marks and End Examination carries 50 marks. Of the 25 marks for Internal, 15 marks shall be awarded for day-to-day work, 5 marks to be awarded by conducting an internal laboratory test and 05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc. The End Examination shall be conducted by the teacher concerned and an external Examiner from other institutions.

5.4. For the subject having design and/or drawing, (such as Engineering Graphics, Machine Drawing etc.) and estimation, the distribution shall be 30 marks for Internal evaluation (15marks for day-to-day work and 5 marks for Internal tests and 10 marks for assignments) and 70 marks for End Examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

5.5. The Engineering drawing, wherever offered is to be treated as a theory subject. Evaluation method adopted for theory subjects shall be followed here as well.

5.6. There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

5.7. The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV Year, II-Semester. The external project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminar (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

5.8. For all practical /main project/CV etc. the HOD of the concerned dept. shall submit a panel of 4 external examiners from different institutes and one will be selected by the Chief Superintendent of the Examination for conducting of end examination.

5.9. **Revaluation of End Examination Scripts**: Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee. Procedure for Revaluation: The script will be revaluated by an examiner appointed by the principal. The maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table 4: Distribution of weightages for examination and evaluation

S.No	Nature of subject	Marks	Type of examination and mode of assessment		Scheme of Examination
1	Theory	70	End Examination. Both internal and external Evaluation (at least a minimum of 50% subjects will be sent for external evaluation)		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.

2	Practical	50	End lab examination (External evaluation)		This End Examination in practical subjects will be for a maximum of 50 marks.
		25	15	Internal evaluation	Day-to-day performance in lab experiments and record.
			05	Internal evaluation	Internal lab examination at the end of year/semester.
			05	Internal evaluation	05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc.
4	Comprehensive Viva (CV)	50	External evaluation		This end viva-voce examination in all the subjects for 50 marks
5	Project work	50	Internal evaluation		Project work for 50 marks
		100	External evaluation		This end viva-voce in project work for 100 marks
6	Skill Oriented Courses/ Skill Advanced Courses/ Soft Skill Courses	30	Internal evaluation		These 30 marks are awarded to the students based on the performance of two Internal examinations with a weight age of 0.75 for better score and 0.25 for the other score.
		70	Internal Evaluation		Based on the performance in the end examination.
7	Internship/ Internal Project/ Study Report/ Work shop	100	Internal evaluation		As per the Guidelines of APSCHE
8	Mandatory Learning Courses	-	-		No examinations. Attendance minimum is required.
9	EAA	-	Internal evaluation		Based on performance and committee report.
10	Technical Seminar	50	Internal Evaluation		Based on Seminar Report, performance and committee report.

6.0 Attendance Requirements:

6.1. The student shall be eligible to appear for End examinations of the semester if he acquires a minimum of 75% of attendance in aggregate of all the subjects of that semester.

6.2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted by the College Academic Committee.

6.3. The student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

6.4. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned.**

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their End Examination of that class and their registration shall stand cancelled.

6.6. The stipulated fee shall be payable towards Condonation of shortage of attendance to the college.

6.7. A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects after

Condonation. In case of the student having less than 50% of attendance in any one of the courses (**One subject / lab only**) during that particular semester, he/she will not be permitted to register and appear for that particular course in that particular semester end examinations. In such cases, the students need to register for makeup classes which will be notified by the CoE office after the completion of that particular semester or at appropriate time whichever is applicable. The students need to secure **90%** of the attendance in the make-up classes to appear for the supplementary examinations thereafter and this will be treated as a second attempt. The number of makeup classes to be conducted will be at least 35% of the regular class work taken in that particular course. **If the attendance is less than 50% in more than one subject/lab he/she will be completely detained in that semester**.

7.0 Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No.6.0.

7.1. The student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or CV or drawing subject or Skill Development Courses or project if he secures not less than 35% of marks in the End Examination (If applicable)) and he has to score minimum of 40% marks from internal and external exam marks put together to clear the subject.

7.2. The student shall be promoted from II to III year only if he fulfils the academic requirement of securing a minimum of 50% (41 credits out of 82) credits from all the exams conducted up to and including II Year II-Semester regular examinations irrespective of whether the candidate takes the examination or not.

7.3. The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 50% (62.5 credits out of 125) credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

Table 5: Promotion rules

Promotion from	Total credits to register	Minimum credits to obtain for promotion
II year to III year	82	41
III year to IV year	125	62.5

7.4. The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 160 credits shall be considered for the calculation of CGPA.

7.5. Students who fail to earn 160 credits as indicated in the course structure in Table-1 within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall stand cancelled.

8.0 Course pattern:

8.1. The entire course of study is of four academic years. Each academic year consists of two semesters

8.2. The student is eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

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Table: 6: Course pattern

Year	Sem	No. of Subjects		Number of Labs		Total credits	
		CSE/ CSE(DS) /CSE&BS/ EEE	ECE/ CE/ Mech.	CSE/ CSE(DS) / CSE&BS/ EEE	ECE/ CE/ Mech.		
First	I	1) BSC - LA&AC 2) BSC - AP 3) ESC - PSP 4) ESC - BEE/BEE/BEE/FED 5) ESC - ED	1) BSC - LA &DE/ LA&AC/ LA&AC 2) BSC - MEC/AC/AC 3) ESC - PSP 4) ESC - FEE/EM /ED 5) HSS - English	1) ESC Lab - E&ITW 2) BSC Lab – EP Lab 3) ESC Lab - PSP	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - PSP Lab	Subjects - 5X3 = 15 Labs - 3X1.5 = 4.5	19.5
	II	1) BSC - DE&VC 2) BSC - MEC 3) ESC - DS 4) ESC - MFCS/MFCS/MFCS/BEE 5) HSS - English 6) ML - ES	1) BSC - AC&TT/ DE&VC 2) BSC - AP/ EP/ EP 3) ESC - DS 4) ESC - NWA/ BEEE/ MS 5) ESC - ED/ ED/ BEM 6) ML - ES	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - DS Lab	1) ESC Lab - E&ITW 2) BSC Lab - EP Lab 3) ESC Lab - DS Lab	Subjects - 5X3 = 15 ML – No Credits Labs - 3X1.5 = 4.5	19.5
Second	I	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 5X3 = 15 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5 EAA - No Credits	21.5
	II	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC/PCC - Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	1) ESC/PCC – Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	Subjects - 4X3 = 12 HSS – 1X3 =3 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5	21.5
Third	I	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	Subjects - 3X3 = 9 OEC/JOE - 1X3 = 3 PEC – 1X3 = 3 SAC/SSC - 1x2 = 2 ML – No Credits Labs - 2X1.5 = 3 Internship - 1X1.5=1.5	21.5
	II	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 3X3 = 9 PEC – 1X3 = 3 OEC/JOE - 1X3 = 3 SAC/SSC - 1x2 = 2 ML - No Credits Labs - 3x1.5 = 4.5	21.5
Fourth	I	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) Industrial/ Research Internship 2) CVV	1) Industrial/ Research Internship 2) CVV	PEC - 3X3 = 9 OEC/JOE - 2X3 = 6 SAC/SSC - 1X2 = 2 HSSE - 1X2 = 2 Internship - 1X3 = 3 CVV - 1X1 = 1	23
	II	1) Technical Seminar 2) Internship in Industry 3) Major Project	1) Technical Seminar 2) Internship in Industry 3) Major Project			Seminar - 1X1 = 1 Internship - 1X5 = 5 Project - 1X6 = 6	12
						Total Credits	160

Note-1: 1) BSC – Basic Science Course
2) ESC – Engineering Science Course
3) HSS – Humanities and Social Science
4) ML – Mandatory Learning Course
5) SOC – Skill Oriented Course
6) SAC – Skill Advanced Course
7) PCC – Professional Core Courses
8) PEC – Professional Elective Course
9) OEC – Open Elective Course
10) JOE – Job Oriented Elective
11) SSC – Soft Skill Course
12) CSP – Community Service Project

Note-2: **Mandatory Learning Courses**

1) EC - Environmental Science
2) UHV - Universal Human Values
3) IHC - Indian Heritage and Culture
4) CI - Constitution of India

Note-3: 1) Summer Internship Two months (Mandatory) after Second Year (to be evaluated during 5th Semester).

2) Industrial/Research Internship Two months (Mandatory) after Third Year (to be evaluated during 7th Semester).

3) Internship in Industry (during 8th Semester)

9.0 Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone this course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered subject to section 2.0 and they continue to be in the academic regulations in which they were readmitted.

10.0 With-holding of results:

If the candidate has any dues not paid to the Institute or if any case of indiscipline of malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

11.0 Award of Class:

After the 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:

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA Secured from 160 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 5.5	

12.0 Grading:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student falls.

Table 8: Conversion into Grades and Grade points assigned

Range in which the % of marks in the subject fall	Grade	Grade point Assigned	Performance
90 to 100	O	10	Outstanding
80 to 89.9	A^+	09	Excellent
70 to 79.9	A	08	Very Good
60 to 69.9	B^+	07	Good
50 to 59.9	B	06	Above Average
45 to 49.9	C	05	Average
40 to 44.9	P	04	Pass
<40	F	00	Fail
AB	AB	00	Fail

12.1. Requirement for clearing any subject: The students have to obtain a minimum of 35% in End Examination and they have to score minimum of 40% marks from Internal and external exam marks put together to clear the subject. Otherwise, they will be awarded fail grade.

12.2. F is considered as a fail grade indicating that the student has to reappear for the end supplementary examination in that subject and obtain a non-fail grade for clearing that subject.

12.3. In case of Skill Oriented/ Skill Advanced/ Soft Skill Subjects, as there is no end exam, all 100 marks are for internal assessment only. Student has to score 40% in these courses to complete the subject which will be evaluated internally. Marks obtained in these courses shall not be considered for award of Division.

12.4. To become eligible for the award of degree the student must obtain a minimum CGPA of 4.0

13.0 Supplementary Examinations:

Apart from the regular End Examinations, the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day. For eighth semester, special (Advance) supplementary examinations will be conducted in second week following the results publication date of regular examination of eighth semester only.

14.0 Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

The Grade Point Average (GPA) for each semester and Cumulative Grade Point Average (CGPA) up to any semester is calculated as follows:

i) Semester Grade Point Average will be computed as follows:

$$GPA = \frac{\sum_1^n C_j \times GP_j}{\sum_1^n C_j}$$

Where, n is the number of subjects in that semester. C_j is Credits for the subjects. GP_j is the grade point obtained for the subject and the summation is over all the subjects in that semester.

ii) A Cumulative Grade Point Average (CGPA) will be computed for every student at the end of each semester. The CGPA would give the cumulative performance of the student from the first semester up to the end of the semester to which it refers to and is calculated as follows:

$$CGPA = \frac{\sum_1^m GPA_j \times TC_j}{\sum_1^m TC_j}$$

Where 'm' is the number of semesters under consideration. TC_j the total number of credits for a j^{th} semester and GPA_j is the Grade Point Average of the j^{th} semester. Both GPA and CGPA will be rounded off to the second digit after decimal and recorded as such.

While computing the GPA / CGPA, the subjects in which the student is awarded zero grade points will also be included.

For any academic/employment purpose the following formulae shall be used for conversion of CGPA to % of marks. % of marks = (CGPA –0.5) x 10.

15.0 Grade Sheet:

A grade sheet (Memorandum) will be issued to each student indicating his performance in all subjects of that semester in the form of grades and also indicating the GPA and CGPA.

16.0 Award of Degree

After having admitted into the program, B.Tech degree shall be conferred on a student who has satisfied the following conditions.

i) The student joining with Intermediate qualification must have, after admission into the Regular B.Tech programme of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.

ii) The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.

iii) The student must have satisfied the minimum academic requirements in appropriate branch of engineering in each semester of the program, herein after prescribed.

iv) Students must register for all the courses and earn the credits specified

v) Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech course and their admission stands cancelled.

vi) The student shall successfully complete non-credit courses like EAA / ML / Internship.

vii) The student has no dues to the institution, library, hostels etc.

viii) The student has no disciplinary action pending against him/her.

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on recommendations by the Academic council of RGMCET (Autonomous) basing on the eligibility as in clause 6.0 and 7.0.

17.0 Transcripts:

After successful completion of prerequisite credits for the award of degree, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

18.0 Rules of Discipline:

18.1. Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

18.2. When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

18.3. When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

18.4. When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

19.0 Minimum Instruction Days:

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

20.0 Amendment of Regulations:

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However, the academic regulations of any student will be same throughout the course of study in which the student has been admitted. However, students will continue to be in the academic regulations in which they were readmitted.

21.0 Transfers

There shall be no branch transfers after the completion of admission process.

22.0 General:

22.1. The Academic Regulations should be read as a whole for the purpose of any interpretation.

22.2. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

22.3. The Institute 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 Institute.

22.4. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

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Academic Regulations for B.Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2021-2022 onwards)

1.0 The students have to acquire a minimum of 121 credits out of 121 from II to IV year of B.Tech. Program (Regular) for the award of the degree.

2.0 Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3.0 The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4.0 Promotion Rule:

The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 43 credits out of 86 credits from all the exams conducted up to and including III-year, II semester regular examinations, whether the candidate takes the examinations or not.

5.0 Award of Class:

After the 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: The marks obtained in the best 121 credits will be considered for the calculation of percentage and award of class.

Table 1: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA secured from 121 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 5.5	

6.0 All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

INSTITUTE VISION

- To develop this rural based engineering college into an institute of technical education with global standards
- To become an institute of excellence which contributes to the needs of society
- To inculcate value based education with noble goal of "Education for peace and progress"

INSTITUTE MISSION

- To build a world class undergraduate program with all required infrastructure that provides strong theoretical knowledge supplemented by the state of art skills
- To establish postgraduate programs in basic and cutting edge technologies
- To create conductive ambiance to induce and nurture research
- To turn young graduates to success oriented entrepreneurs
- To develop linkage with industries to have strong industry institute interaction
- To offer demand driven courses to meet the needs of the industry and society
- To inculcate human values and ethos into the education system for an all-round development of students

INSTITUTE QUALITY POLICY

- To improve the teaching and learning
- To evaluate the performance of students at regular intervals and take necessary steps for betterment
- To establish and develop centers of excellence for research and consultancy
- To prepare students to face the competition in the market globally and realize the responsibilities as true citizen to serve the nation and uplift the country's pride.

VISION OF THE DEPARTMENT

- To become a center of excellence in academics and research in Electronics and communication engineering to meet the present and future needs of society with human face.

MISSION OF THE DEPARTMENT

- To educate the students in latest technologies to achieve best standards in theoretical and practical aspects.
- To have a strong collaboration with electronics industry.
- To develop indigenous and appropriate technologies at low cost to help the rural people.

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs)

PEO-1: To train competent Electronics & Communication Engineers in analysis, design and testing of electronics systems by providing modern tools.

PEO-2: To prepare graduates to take up gainful employment in core sector and prepare them for a successful career in Multinational companies.

PEO-3: To impart skills to develop affordable products for rural people by adopting multidisciplinary approach.

PEO-4: To undertake sponsored projects, consultancy and internships by strengthening industry institute collaboration.

Program Specific outcomes (PSOs)

PSO-I: Students are able to analyze and design the electronic circuits with the knowledge of courses related circuits, networks, linear digital circuits and Analog electronics.

PSO-II: Student can explore the scientific theories, ideas, methodologies in operation and maintenance of communication systems to bridge the gap between academics and industries.

PSO-III: Students are able to work professionally with new cutting edge Technologies in the fields of electronic design, communication and automation

Note: Program Outcomes (POs) and Program Specific Outcomes (PSOs) are mapped with Course Outcomes (COs) and they are correlated in following levels

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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I B.TECH., I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
Theory Subjects								
A0006201	Linear Algebra and Differential Equations	2	1	0	3	30	70	100
A0005201	Modern Engineering Chemistry	2	1	0	3	30	70	100
A0501201	Problem Solving and Programming	2	1	0	3	30	70	100
A0201201	Fundamentals of Electrical Engineering	2	1	0	3	30	70	100
A0003201	English for Engineers	2	1	0	3	30	70	100
Laboratories								
A0091201	Digital English Language Lab	0	0	3	1.5	25	50	75
A0092201	Engineering Chemistry Lab	0	0	3	1.5	25	50	75
A0591201	Problem Solving and Programming Lab	0	0	3	1.5	25	50	75
	Contact Periods / Week	**10**	**5**	**9**	**19.5**	**225**	**500**	**725**

I B.TECH., II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
Theory Subjects								
A0008202	Advanced Calculus and Transformation Techniques	2	1	0	3	30	70	100
A0004201	Applied Physics	2	1	0	3	30	70	100
A0502202	Data Structures	2	1	0	3	30	70	100
A0204202	Networks Analysis	2	1	0	3	30	70	100
A0301201	Engineering Drawing	1	0	4	3	30	70	100
Mandatory Learning Course								
A0010202	Environmental Science	2	0	0	0	0	0	0
Laboratories								
A0592201	Engineering Workshop & IT Workshop	0	0	3	1.5	25	50	75
A0093201	Engineering Physics lab	0	0	3	1.5	25	50	75
A0593202	Data Structures Lab	0	0	3	1.5	25	50	75
	Contact Periods / Week	**11**	**4**	**13**	**19.5**	**225**	**500**	**725**

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II B.TECH., I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
Theory Subjects								
A0016203	Vector Calculus & Complex Variables	2	1	0	3	30	70	100
A0403203	Electronic Devices and Circuits	2	1	0	3	30	70	100
A0404203	Digital Logic Circuits Design	2	1	0	3	30	70	100
A0405203	Signals and Systems	2	1	0	3	30	70	100
A0017203	Managerial Economics and Financial Analysis	2	1	0	3	30	70	100
Skill Development Course								
A0012203	Design Thinking and Innovations	1	2	0	2	30	70	100
Mandatory Learning Course								
A0015203	Universal Human Values	2	0	0	0	0	0	0
Laboratories								
A0491203	Electronic Devices and Circuits Lab	0	0	3	1.5	25	50	75
A0292203	Electrical Engineering Lab	0	0	3	1.5	25	50	75
A0492203	Basic Simulation Lab	0	0	3	1.5	25	50	75
	Contact Periods / Week	**13**	**7**	**9**	**21.5**	**255**	**570**	**825**

II B.TECH., II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
Theory Subjects								
A0504203	Python Programming	2	1	0	3	30	70	100
A0408204	ARM Microcontroller & its Interfacing	2	1	0	3	30	70	100
A0409204	Electronic Circuits – Analysis and Design	2	1	0	3	30	70	100
A0410204	Electromagnetic Fields and Transmission Lines	2	1	0	3	30	70	100
A0411204	Random Variables and Random Process	2	1	0	3	30	70	100
Skill Development Course								
A0019203	Aptitude Arithmetic Reasoning and Comprehension	1	2	0	2	30	70	100
Laboratories								
A0571203	Python Programming Lab	0	0	3	1.5	25	50	75
A0495204	ARM Programming Lab	0	0	3	1.5	25	50	75
A0496204	Electronic Circuits – Analysis and Design Lab	0	0	3	1.5	25	50	75
	Contact Periods / Week	**11**	**7**	**9**	**21.5**	**255**	**570**	**825**

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III B.TECH., I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		L	T	P		Internal	External	Total
Theory Subjects								
A0412205	Linear and Digital IC Applications	2	1	0	3	30	70	100
A0413205	Analog Communication	2	1	0	3	30	70	100
A0414205	Antennas and Wave Propagation	2	1	0	3	30	70	100
Professional Elective-I								
A0218205	Control Systems Engineering							
A0416205	Sensors and Signal Conditioning	2	1	0	3	30	70	100
A0215205	Neural Networks & Fuzzy Systems							
A0417205	Bio-Medical Instrumentation							
Open Elective-I/Job Oriented Elective/MOOCs								
A0515205	Artificial Intelligence							
A0026205	Mathematical Methods							
A0418205	Virtual Instrumentation	2	1	0	3	30	70	100
A3401203	Business Environment							
Skill Development Course								
A0419205	Arduino & MSP 430 Programming	1	2	0	2	30	70	100
Mandatory Learning Course								
A0014203	Indian Heritage & Culture	2	0	0	0	0	0	0
Laboratories								
A0497205	Linear and Digital Integrated Circuit Applications Lab	0	0	3	1.5	25	50	75
A0498205	Analog Communication Lab	0	0	3	1.5	25	50	75
A0023205	Community Service Project/Summer Internship	0	0	3	1.5	0	100	100
	Contact Periods / Week	**13**	**7**	**9**	**21.5**	**230**	**620**	**850**

III B.Tech., II-Semester Course Structure

Subject Code	Name of the Subject	Hours/Week				Marks		
		L	T	P	Credits	Internal	External	Total
Theory Subjects								
A0423206	Digital Signal Processing	2	1	0	3	30	70	100
A0424206	Microwave Engineering and Optical Communication	2	1	0	3	30	70	100
A0425206	Digital Communication	2	1	0	3	30	70	100
Professional Elective-II								
A0421206	VLSI Design							
A0426206	Digital TV Engineering	2	1	0	3	30	70	100
A0427206	Information Theory and Coding							
A0428206	Embedded System Concepts							
Open Elective-II/ Job Oriented Elective								
A0532206	Cyber Security							
A0533206	Ethical Hacking	2	1	0	3	30	70	100
A0513205	Web Programming							
A0506203	Computer Organization & Architecture							
Skill Development Course								
A0429206	Digital Design using Verilog	1	2	0	2	30	70	100
Mandatory Learning Course								
A0022203	Constitution of India	2	0	0	0	0	0	0
Laboratories								
A0481206	Digital Communication Lab	0	0	3	1.5	25	50	75
A0482206	Microwave and Optical Communications Lab	0	0	3	1.5	25	50	75
A0483206	Digital Signal Processing Lab	0	0	3	1.5	25	50	75
	Contact Periods / Week	**13**	**7**	**9**	**21.5**	**255**	**570**	**825**

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IV B.TECH., I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
Professional Elective-III								
A0430207	Digital Image Processing							
A0432207	Advanced Digital Signal Processing	2	1	0	3	30	70	100
A0439207	DSP Processors Architectures and applications							
A0438207	Radio Frequency Identification							
Professional Elective-IV								
A0431207	Mobile Communication							
A0435207	Satellite Communication	2	1	0	3	30	70	100
A0434207	Spread Spectrum Communication							
A0441207	Embedded System Design							
Professional Elective-V								
A0440207	Radar Systems							
A0442207	Opto Electronic Devices	2	1	0	3	30	70	100
A0437207	FPGA Architecture and Applications							
A0436207	Low Power VLSI Design							
Open Elective-III/ Job Oriented Elective/MOOCs								
A0543207	Machine Learning							
A0512205	Core Java Programming	2	1	0	3	30	70	100
A0507203	Database Management Systems							
A0544207	Real Time Operating Systems							
Open Elective-IV/ Job Oriented Elective								
A0523205	Advanced Computer Architecture							
A0443207	Network Security and Cryptography	2	1	0	3	30	70	100
A0540206	Internet of Things (IoT)							
A0516205	Computer Networks							
Skill Development Course								
A0445207	Micro wind and Lab View	1	2	0	2	30	70	100
Humanities and Social Sciences								
A0030207	Personnel Etiquette	2	0	0	2	30	70	100
A0094207	Comprehensive Viva	0	0	0	1	0	50	50
A0095207	Industrial/Research Internship	0	0	0	3	0	0.	100
	Contact Periods / Week	**13**	**7**	**0**	**23**	**210**	**640**	**850**

IV B.TECH., II SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject Hours/Week					Marks		
		Theory	Tutorial	Lab	Credits	Internal	External	Total
A0096208	Technical Seminar	0	0	0	1	50	0	50
A0097208	Internship in Industry	0	0	0	5	0	100	100
A0098208	Major Project	0	0	0	6	50	100	150
	Contact Periods / Week	**0**	**0**	**0**	**12**	**100**	**200**	**300**

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, I-Sem (ECE)

L	T	C
2	1	3

(A0006201) LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

For Branch: ECE

COURSE OBJECTIVES:

- To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
- To equip the students to solve various application problems in Signals and Systems, Control systems, Network analysis and Digital signal processing etc.,

COURSE OUTCOMES:

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

- Understand the use of matrices and linear system of equations in solving Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Identify the applications of advanced calculus & Linear algebra in electro-magnetic theory and in telecommunication engineering.
- Obtain the knowledge of first and higher order differential equations and its use in solving Circuit analysis, heat transfer problems in engineering.
- Understand the concept of Laplace and Inverse Laplace transformation and solving ODEs using Laplace transformation technique.
- Analyse applications of Laplace transforms in control system engineering and Signals and system engineering.

MAPPING OF COs & POs:

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

UNIT I

Matrices: Elementary row transformations – Rank – Echelon form, Normal form – Solutions of Linear System of Homogenous and Non-Homogeneous equations.

UNIT II

Eigen Values, Eigen vectors – Properties – Cayley – Hamilton Theorem – Inverse and Power of a matrix by Cayley – Hamilton theorem.

UNIT III

Differential equations of first order and first degree – Formation of ODEs – Solution of ODEs - Exact, Non – Exact, Linear and Bernoulli's equations – Applications of ODEs to L-R & C-R circuits.

UNIT IV

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type, e^{ax}, $\sin ax, \cos ax$, Polynomials in x, $e^{ax}\,V(x)$, $xV(x)$, Method of Variation of parameters.

UNIT V

Laplace transform of standard functions – Inverse Transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem –

Dirac's delta (Unit Impulse) function – Convolution theorem (without proof). Laplace transform of Periodic function

UNIT VI

Application of Laplace transforms to solve Ordinary Differential Equations of first order and second order.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – I, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L.Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Veerarajan T, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4) Ramana B.V, Higher Engineering Mathematics, Tata McGraw Hill, New Delhi, 11th Reprint, 2010.
5) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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I B.Tech, I-Sem(ECE)

T	L	C
2	1	3

(A0005201) MODERN ENGINEERING CHEMISTRY
For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To understand the concepts of molecular structures and bonding.
- To explain the students on the principles and applications of electrochemistry.
- To demonstrate about the preparation and applications of polymers.
- To introduce the advanced concepts about nanomaterials.
- To introduce the basic principles of UV and IR spectroscopy.
- To familiarize about Surface chemistry and its applications.

COURSE OUTCOMES:
At the end of the course, the students will be able to:
- Concept of Molecular Orbital Theory and Crystal Field Theory (L2)
- Explain about the conductance and role of electrodes in electrochemistry (L1)
- Explain the preparation, properties, and applications of thermoplastics & elastomers (L2)
- Explain the preparation, properties, and applications of Nano materials.
- Understanding the principles of UV-Visible & IR Spectroscopes (L2)
- Summarize the applications of adsorption in Industries (L2)

MAPPING OF COs & POs:

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

UNIT 1: Molecular Structure and Bonding
Molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – Energy level diagrams of O_2 and NO–Crystal field theory and its salient features – splitting in octahedral and tetrahedral geometry – Band theory of solids – band diagrams for conductors, semiconductors and insulators.

UNIT 2: Electrochemistry and Applications
Introduction – Conductance, Specific conductance, Equivalent Conductance and molar conductance – Determination of equivalent conductance by Wheatstone bridge method – Conductometric titrations (acid-base titrations) – Numerical Problems on conductance - Electrodes – Reference electrode (Standard hydrogen electrode) – Daniel cell.

UNIT 3: Polymer Technology
Classification of polymers – Functionality – Chain growth, step growth polymerization and Copolymerization with specific examples– Mechanisms of additional polymerization.
Plastics: Preparation, properties and applications of PVC, Teflon and Bakelite.
Elastomers: Buna-S and Buna-Npreparation, properties and applications.

UNIT-4 Advanced Engineering Materials
Nanoparticles: Introduction, preparation methods – Sol-gel method, Chemical reduction method – properties and applications in Graphene and CNT.
Super capacitors: Definition, Classification – Engineering Applications.

UNIT 5: Instrumental Methods and Applications

Electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law, UV-Visible Spectroscopy: Types of electronic transitions, Absorption and Intensity Shifts, Principle, Instrumentation and its applications. IR Spectroscopy: Types of Molecular vibrations, Principle, Instrumentation and its applications.

UNIT 6: Surface Chemistry and Applications

Introduction to surface chemistry, Adsorption- Types of adsorption, Adsorption of gases on solids and its applications, Adsorption isotherm-Langmuir adsorption isotherm theory and postulates.

Colloids: Definition, micelle formation, synthesis of colloids (Chemical and Bredigs method with examples).

TEXT BOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry Pearson India Education Services Pvt. Ltd

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I B.Tech, I-Sem (ECE) | L | T | C
| 2 | 1 | 3

(A0501201) PROBLEM SOLVING AND PROGRAMMING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Introduce the internal parts of a computer, and peripherals.
- Introduce the Concept of Algorithm and use it to solve computational problems
- Identify the computational and non-computational problems
- Teach the syntax and semantics of a C Programming language
- Demonstrate the use of Control structures of C Programming language
- Illustrate the methodology for solving Computational problems

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Construct his own computer using parts (L6).
- Recognize the importance of programming language independent constructs (L2)
- Solve computational problems (L3)
- Select the features of C language appropriate for solving a problem (L4)
- Design computer programs for real world problems (L6)
- Organize the data which is more appropriated for solving a problem (L6)

MAPPING OF COs & POs:

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

UNIT I
Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Learning Outcomes: Student should be able to
1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

UNIT II
Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Learning Outcomes: Student should be able to
1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyse the algorithms (L4)

UNIT III

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input Output Statements with suitable illustrative "C" Programs.
Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative C Programs.

Learning Outcomes: Student should be able to
1. Understand keywords, data types in C (L2)
2. Use various operators in C program (L6)
3. Apply type conversions and also understand, analyse precedence and associativity (L2)

UNIT IV

Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, Switch-Statement and goto statement with suitable illustrative C Programs.
Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue statements.

Learning Outcomes: Student should be able to
1. Select the control structures for solving the problem (L4)
2. Apply statements for solving the problem (L3)
3. Understand the statements in C language (L2)

UNIT V

Arrays: Definition, Importance of an array in C language, One-Dimensional Arrays, Two-Dimensional Arrays, Example programs on the topics mentioned above
Strings: Introduction to Strings, String I/O, String Operations and functions.
Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs. exit( ), Parameter Passing mechanisms, Call-by-Value, Recursion.

Learning Outcomes: Student should be able to
1. Design and develop C programs using functions and arrays. (L6)
2. Apply modular approach for solving the problem (L3)
3. Understand and apply various string handling functions (L2)

UNIT VI

Files: Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions(standard library input / output functions for files), file status functions (error handling),Positioning functions, command –line arguments, C program examples.
Storage Classes, pre-processor directives.

Learning Outcomes: Student should be able to
1. Describe the Files types and File operations. (L2)
2. Practice Command line arguments. (L3)
3. Perform Error handling in File related programming in C.(L4)

TEXT BOOKS:

1. PradipDey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

REFERENCE BOOKS:

1) P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
2) RS Bichkar "Programming with C", 2012, Universities Press.
3) Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

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AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, I-Sem (ECE)

L	T	C
2	1	3

(A0201201) FUNDAMENTALS OF ELECTRICAL ENGINEERING

For Branch: ECE

COURSE OBJECTIVES:

- This course introduces the basic concepts of electric circuits and magnetic circuits.
- This course also introduces the working principles of different machines.
- This course introduces basic knowledge on series and parallel circuits.
- To exposes the students to the real time applications of various types of machines.
- To provide theoretical prerequisites necessary to do lab work on different machines.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Describe the basic concepts of DC and electromagnetic circuits.
- Understand the fundamental principles of different machines and electric circuits.
- Demonstrate the working operation and performance parameters of different machines.
- Analyse the various conditions of electrical machines and circuits.
- Predict the testing procedures of electric circuits and calculations of different machines.
- Design and test various electric circuits and machines.

MAPPING OF COs & POs:

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

UNIT I:

DC CIRCUITS: Basic definitions of Charge-Voltage- Current- Power- Energy- Work done-ohm's law- voltage and current sources-Resistor- inductor-capacitor-resistors in series & parallel-kirchhoff's laws-analysis of simple circuits with dc excitation- Star to delta and delta to star transformations- simple problems.

UNIT –II:

MAGNETIC CIRCUITS: Flux-reluctance-Permeance – mmf – reluctivity-comparison between electrical circuit and magnetic circuit-Faraday's laws-Lenz's law-Flemings right hand rule-Induced emf-Dynamically induced emf-Statically induced emf-self-inductance–mutual inductance-coefficient of coupling-Problems on relations of basic terms in electric circuits.

UNIT –III

DC GENERATOR: Principle of operation of DC Generator, Construction details of DC Generator - EMF Equation, simple numerical problems on E.M.F equation. Types of Generators-series shunt& compound Generator-Numerical problems on types of Generators.

UNIT –IV

DC MOTORS: Principle of operation of DC Motor- Significance of Back E.M.F-voltage and power equation of dc motor, condition for maximum power-Types of DC Motors-series, shunt, short & long shunt compound motor, torque & speed equation- speed control of DC Shunt Motor –armature control method, field control method-Applications of dc motors –losses and efficiency -Numerical problems on types and torque equation.

UNIT –V

TRANSFORMERS: Principle of operation of Transformer-constructional features- Phasor Diagram on no-load and R-load – equivalent circuit-losses, efficiency and regulation of a transformer, OC & SC tests on transformer- Numerical problems on E.M.F equation and Efficiency.

UNIT –VI

THREE PHASE INDUCTION MOTOR: Classification – Rotating Magnetic Field Theory-Construction – Comparison between Squirrel Cage Induction Motor and Slip Ring Induction Motor – Applications – Working Principle of Induction Motor – Comparison between Induction Motor and Transformer – Synchronous Speed – Slip – Frequency of Rotor Current – Simple Problems on Speed and Slip.

TEXT BOOKS:

1) Principle of Electrical Engineering by V.K.Mehta, Rohith Mehta, S.Chand publications.
2) Electrical and Electronic Technology - 10th Edition - Edward Hughes, Pearson Publications
3) Engineering Circuit Analysis - 8th Edition - W.Hayt & J.E.Kemmerly, McGraw Hill Publications
4) Basic Electrical Engineering - 2nd Edition - Kothari & Nagrath, TMH Publications
5) Electrical Technology, 8th Edition, Volume-II, B L Theraja, S. Chand.

REFERENCE BOOKS:

1) Electrical Machinery - J B Guptha - katsonbooks.
2) Electrical Machines - I J Nagrath and D P Kothari - PHI Publications.
3) Electrical Machines by P.S.Bimbra, Khanna publication.
4) Introduction to Electrical Engineering - 3rd Edition - M.S.Naidu & S.Kamakshaiah, TMH Publ.

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I B.Tech, I-Sem(ECE)

T	L	C
2	1	3

(A0003201) ENGLISH FOR ENGINEERS

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES

- English for Engineers is prescribed to make students communicate their thoughts, opinions and ideas freely in real life situations.
- To improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- To equip students with professional skills & soft skills
- Develop Communication skills in formal and informal situations.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Students will be able to use creativity in writing such as E-mails, Reports, Resume writing and Info- Graphics to enhance engineering abilities
- Students will analyse the concepts of critical and analytical Reading skills to understand needs of engineering in society by using modern tools
- Students will be able to develop flair for any kind of writing with rich vocabulary to enhance communicative skills
- Students will understand the basic Grammar techniques and utilize it for language development
- Students will apply the strategies of Soft skills & Ethical components

MAPPING OF COs & POs:

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

UNIT- I

a) Reading: Skimming the text for theme
   Reading Text: Engineering in Society by Sarah Bell
b) Grammar: Types of Sentences - Demonstratives- Articles- Prepositions
c) Writing: Paragraph Writing & Practice
d) Vocabulary: Root words - Word lists from Word power Made Easy by Norman Lewis
   Method of Teaching: Analysing the theme of Reading Prescribed Text, Worksheets on Articles & Prepositions, Assignment on Short paragraphs, Vocabulary activities through worksheets.

UNIT- II

a) Reading: Scanning the text for specific details
   Reading Text: Sultana's Dream by Begum Rokeya
b) Grammar: Tenses & Usage
c) Writing: Formal Letters and E-mail writing – Tips & Practice
d) Vocabulary: Homonyms - Word lists & Practice
   Method of Teaching: Classroom discussion &critical appreciation of the Reading Lesson, Worksheets on Tenses, Practice of Formal Letters, Vocabulary Quizzes- Assignment.

UNIT- III

a) Reading: Note-making (identifying the main ideas and making notes)
Reading text: Satya Nadella: When Empathy is Good for Business
https://www.morningfuture.com
b) Grammar: Framing questions –Wh Qs - Yes/No questions - Question Tags
c) Writing: Resume & Cover letter Writing- Tips &Practice
d) Vocabulary: Synonyms & Antonyms
Method of teaching: Class room Discussions, Student Activity on Questions, E-mail writing, Vocabulary activities through games- Practice- Assignment.

UNIT – IV

a) Reading: Summarizing
Reading Text: Life is a Pizza by Richard Templar from Rules of Life
b) Grammar: If Clauses – Usage & Practice
c) Writing: Writing Definitions – Process of Writing - Tips & Practice
d) Vocabulary: Idioms & Phrases- Practice
Method of Teaching: Discussion & Assignment, If Clauses from Newspapers, Preparing profiles for Resume, Vocabulary activities through worksheets

UNIT – V

a) Reading: Intensive reading (reading for every detail)
Reading text: What is a Drone: Main Features & Applications of Today's Drones by Jack Brown
b) Grammar: Active Voice –Passive Voice- Usage
c) Writing: Report Writing- Types - Practice
d) Vocabulary: Technical Terms- Word Lists- Practice
Method of Teaching: Assignment on Drones, Worksheets on Active/ Passive voice**,** Watch a Documentary on social issues and draft a Report, Technical Terms- Quiz.

UNIT- VI

a) Reading: Appreciating a poem (focus on genre)
Reading text: Where the mind is without fear by Rabindranath Tagore
b) Grammar: Direct & Indirect Speech - Common Errors- Practice
c) Writing: Info-Graphics- Types- Practice
d) Vocabulary: Foreign Derived Words- Word Lists from Norman Lewis Word Power Made Easy
Method of teaching: Learner's interaction on the poem, Practicing Grammar through on line tests, practice reading and understanding graphs, Quiz & worksheets.

REFERENCE TEXT BOOKS:

1) English Language & Communication Skills for Engineers (AICTE Syllabus) by Sanjay Kumar & Pushpa Latha, Oxford University Press, 2018
2) Practical English Usage by Michael Swan, Oxford University Press.
3) Technical Communication, Principles and Practice by Meenakshi Raman & Sangeetha Sharama, Oxford University Press, 2016
4) Word Power Made Easy by Norman Lewis, Goyal Publications.
5) 4000 Essential English Words 3 by Paul Nation, Compass Publishing, 2009.
6) GRE/TOEFL Sources to teach vocabulary

ONLINE SOURCES FOR PRESCRIBED READING TEXTS:

1. https://www.morningfuture.com

2. https://www.raeng.org.uk/publications/reports/engineering-in-society
3. https://digital.library.upenn.edu/women/sultana/dream/dream.html, https://www.mydronelab.com/blog/what-is-a-drone.html
4. https://www. Freealbaab.free.fr › The Rules of Life PDF
5. https://www.poetryfoundation.org ›Gitanjali 35 by Rabindranath Tagore | Poetry Foundation

ONLINE SOURCES FOR PRESCRIBED LISTENING SKILLS:

1. https://learnenglish.britishcouncil.org/skills/listening
2. https://agendaweb.org/listening/comprehension-exercises.html
3. https://www.123listening.com/
4. https://www.linguahouse.com/learning-english/skill-4-learners/listening
5. https://www.talkenglish.com/listening/listen.aspx
6. https://ed.ted.com/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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I B.Tech, I-Sem(ECE) | T | P | C
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(A0091201) DIGITAL ENGLISH LANGUAGE LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

The Digital English Language Lab focuses on the production and practice of sounds of language and equips students with the use of English and vocabulary in everyday situations and contexts.

COURSE OBJECTIVES:
- To facilitate the students to use language effectively in everyday social conversations
- To expose the students to the blend of self-instructional and modes of language learning teacher assisted through digital lab
- To improve the fluency and intelligibility of student in spoken English and neutralize their mother tongue influences
- To help the students to participate in group discussions, to face interviews and shape the individual language learning

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Social interactions, greetings, self-introductions and group talk
- Improving standard pronunciation patterns and neutralize the mother tongue impact
- Developing communication through listening, reading, speaking and writing activities
- Enhancing vocabulary and grammar to develop professional language
- Improving life skills through GD and role plays practices

MAPPING OF COs& POs:

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

Digital English Language Lab consists of two parts:
1) CALL (Lab): Computer Assisted Language Learning
2) ICS (Lab): Interactivity Communication Skills

EXERCISE-I
a) Introduction to Phonetics - Speech Sounds - Vowels - Phonetic Transcription -CALL Lab
b) Ice Breaking Activity - Self Introductions (SWOT) –Social Interactions -Pair work - ICS Lab

EXERCISE-II
a) Diphthongs - Consonants - Phonetic Transcription - CALL Lab
b) Just A Minute (JAM) - ICS Lab

EXERCISE-III
a) Listening Comprehension (audio) - IELTS Testing Exercises -CALL Lab
b) Speaking Activity - Group talk - ICS Lab

EXERCISE-IV
a) Vocabulary Building - Synonyms & Antonyms - Analogy - Testing Exercises -CALL Lab

b) Narration of a Story/Event/ Describing an Object - ICS Lab

EXERCISE-V

a) Situational Dialogues - CALL Lab
b) Role Play - ICS Lab

EXERCISE-VI

a) Pronunciation Evaluation Testing Exercises through EPD - CALL Lab
b) Group Discussion - ICS Lab
   - Any student-based activities

PRESCRIBED SOFTWARE:

K-VAN Solutions (licensed software)

1) Advance Communication Skills Lab
2) English Language Communication Skills Lab
3) Cambridge Advanced Learners' English Dictionary with CD
4) IELTS Academic Preparation and Practice with CD

BOOKS SUGGESTED FOR DELL: (CENTRAL LIBRARY)

1) Skill Pro – A Course in Communication Skills and Soft Skills by Prof. K. Sumakiran et.al, EMESCO.
2) Skill Pro-I Foundation Course - 4 - by Dr. G. Gulam Tariq et.al, Maruthi Publications.
3) Strengthen Your Steps – A Multimodal Course in Communication skills by Dr. M. Hari Prasad et.al
4) English Pronouncing Dictionary Daniel Jones Current Edition with CD
5) English Dictionary for Advanced Learners, (with CD) International edn.Macmillan 2009.

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I B.Tech, I-Sem(ECE)

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(A0092201) ENGINEERING CHEMISTRY LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Verify the fundamental concepts with experiments

COURSE OUTCOMES:

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

- Learning the analytical skills while doing the experiments (L3)
- prepare simple and advanced polymer materials (L2)
- Measure the concentration of the solutions by conductometric titrations (L3)
- Analyse the IR and UV-Visible Spectra of some organic compounds (L3)

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS:

1) Preparation of standard $K_2Cr_2O_7$ solution
2) Estimation of Hardness of Water by using Standard EDTA solution
3) Estimation of Copper by using Standard EDTA solution
4) Estimation of Magnesium by using Standard EDTA solution
5) Estimation of Ferrous Ion by Dichrometry.
6) Determination of Strength of given Hydrochloric Acid against standard sodium hydroxide solution by Conductometric titrations
7) Determination of Strength of given Acetic Acid against standard sodium hydroxide solution by Conductometric titrations
8) Determination of strength of mixture of acids against standard sodium hydroxide solution by conductometric method.
9) Verification of Beer-Lambert's law
10) Determine the strength of Cu(II) ion by colorimeter
11) Preparation of a simple polymer (PVC)
12) Preparation of Bakelite
13) Thin layer chromatography
14) Identification of simple organic compounds by IR and UV-Visible Spectroscopy graphs.
15) HPLC method in separation of liquid mixtures.

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(A0591201) PROBLEM SOLVING AND PROGRAMMING LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To learn about different types of operators
- To learn how decision making is done during programming
- To learn about various simple constructs used for programming
- To learn to define functions and call them with appropriate parameters
- To understand the usage of string libraries to do common string operations
- To understand pointer referencing and pointer dereferencing

COURSE OUTCOMES:
At the end of this course, the student would be able to:
- Apply the specification of syntax rules for numerical constants and variables, data types
- Know the Usage of various operators and other C constructs
- Design programs on decision and control constructs
- Develop programs on code reusability using functions
- Implement various concepts of arrays and strings

MAPPING OF COs & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:
Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1
Write a C program to demonstrate various operators used in C language.

EXERCISE 2
a) Write a C program to find the roots of a quadratic equation.
b) Write a C program to find both the largest and smallest number in a list of integers.

EXERCISE 3
a) Write a C program, which takes two integer operands and one operator from the user, performs the specified operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
b) Write a C Program to find the reverse of a given number.

EXERCISE 4
a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first ‘n‘ terms of the Fibonacci sequence.
[**Note:** A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.]
c) Write a C program to generate all the prime numbers between 1 and n, where ‘n‘ value is given by the user.
[**Note:** Develop each of the above programs by using different loop constructs supported by C language. (i.e., while, do while and for Loops)]

EXERCISE 5

a) Write a C Program to mask the most significant digit of the given number.
b) Write a program which Prints the following pattern

EXERCISE 6

a) Write a C program to find all the even numbers in the given one dimensional array.
b) Write a C program to print the elements of an array in reverse order.
c) Write a C program to construct a pyramid of numbers.

EXERCISE 7

Write a C program to perform the following operations:

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

[Note: Use functions to implement the above specified operations]

EXERCISE 8

Write C programs that use both recursive and non-recursive functions

a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

EXERCISE 9

a) Write a C Program to solve the Towers of Hanoi problem by using recursive function.
b) Write a C Program to demonstrate the various storage classes, which are supported by the C language. [i.e., automatic, external, static and register]

EXERCISE 10

a) Write a C Program to demonstrate that, how to pass an entire array as an argument to a function with a suitable example.
b) Write a C Program to perform various operations on given two strings using string handling functions.

EXERCISE 11

a) Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string in to a given main string from the specified position.
   ii) To delete '**n**' Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

EXERCISE 12

a) Write a C program that displays the position or index in the string 'S' where the string 'T' begins, or – 1 if 'S' doesn't contain 'T'.
b) Write a C program to count the lines, words and characters in a given text.

EXERCISE 13

a) Write a C program to reverse the first 'n' characters in a file.
b) Write a C program to merge two files into a third file.

REFERENCE BOOKS

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4) Computer Basics and C Programming, V. Raja Raman, PHI Publications

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I B.Tech, II-Sem (ECE)

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2	1	3

(A0008202) ADVANCED CALCULUS AND TRANSFORMATION TECHNIQUES
For Branch: ECE

COURSE OBJECTIVES:
- To familiarize the concepts of advanced calculus.
- To equip the students to solve various application problems in Signals and Systems, Control systems, Network analysis and Digital signal processing etc.,

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understanding the concept of mean value theorems and its applications in maxima and minima of function of two variables.
- Analysing the topic of double and triple integrals to understand the evaluation of surface and volume integrals.
- Determine the process of expanding periodic functions into Fourier series and non-periodic functions into Fourier transform its use in Electrical circuit analysis and signal processing.
- Obtain the knowledge of Transforms and its applications in digital electronics, control systems, signal processing & discrete systems.
- Understanding the concept of Z-transformations to analyse the discrete systems in signal and system analysis.

MAPPING OF COs & POs:

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

UNIT-I
Mean value theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and Maclaurin's Series.
Functions of several variables – Jacobian – Maxima and Minima of functions of two variables - Lagrange method of Multipliers with three variables only.

UNIT – II
Multiple integrals: – Evaluation of Double integrals (Cartesian and Polar) – Change of Variables – Change of order of Integration – Changing into Polar coordinates – Evaluation of triple integrals.

UNIT – III
Special functions: Gamma function – Properties – Beta function – properties – Relation between Gamma and Beta functions – Evaluation of Integrals using Gamma & Beta functions.

UNIT – IV
Fourier series: Determination of Fourier coefficients – Fourier series in $[C, C + 2\pi]$ – Fourier series of Even and odd functions –Fourier series expansion in arbitrary intervals. Half - range Fourier sine and cosine series expansions.

UNIT - V
Fourier Transforms: Fourier integral theorem (statement only) – Fourier sine and cosine

integrals - Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Parseval's identity for Fourier transforms.

UNIT – VI

Z-transform: Z – transform – Properties – Damping rule – Shifting rules – Initial and final value theorems – Inverse Z – transform – Partial fractions method– Convolution theorem – Solution of difference equations by Z – transforms.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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I B.Tech, II-Sem (ECE)

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(A0004201) APPLIED PHYSICS

For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To provide basic concepts of optics, quantum physics, semiconductors and their applications to the engineering students.

COURSE OUTCOMES:

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

- Understand the concept of signals by studying the properties of light.
- Construct a quantum mechanical model to explain the behavior of a system at the microscopic level.
- Analyse the structures of materials.
- Identify the semiconducting materials for a particular application.
- Develop new optoelectronic devices for various applications.

MAPPING OF COs & POs:

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

UNIT-I: WAVE –OPTICS

Interference: Introduction –Division of amplitude–Newton's rings and its applications.

Diffraction: Introduction – Fraunhofer diffraction at single slit– Diffraction Grating– Grating spectra –Determination of wavelength of light.

UNIT-II: QUANTUM MECHANICS

Introduction to quantum physics – Wave-Particle duality – de Broglie hypothesis – Verification of wave character of Matter waves (Davison–Germer experiment)– Uncertainty principle– Thought experiment (Electron diffraction) – Wave function (ψ) –Schrodinger's one-dimensional time-independent wave equation – Particle in 1D-potential box.

UNIT III: QUANTUM OPTICS & FIBER OPTICS

Lasers: Characteristics – Einstein's coefficients – Radiation processes – Population inversion – Pumping processes Lasing action –Nd-YAG and He-Ne lasers – Engineering applications

Fiber Optics: Structure –Principle – Acceptance angle, Numerical aperture – Propagation of light in Step-index and Graded-index fibers–Applications: Fibre optic communication system (Block diagram).

UNIT IV: THE CRYSTAL STRUCTURE OF SOLIDS

Introduction –Space lattice – Basis – Unit cell (primitive and Non-primitive) – Crystal systems – Bravais lattices –Atomic radius, Nearest neighboring distance, Coordination number and packing factor for SC, BCC, FCC lattices – Diamond structure – Crystal planes and directions– Miller Indices – calculation of interplanar distance.

UNIT V: FREE ELECTRON THEORY & BAND STRUCTURE OF SOLIDS

Introduction –Free electron theory–Sources of electrical resistivity – Fermi energy – Fermi level – Effect of temperature on Fermi distribution function – Kronig-Penny model (qualitative)–Energy bands– Effective mass – Classification of materials based on band theory.

UNIT VI: SEMICONDUCTOR PHYSICS & DEVICES

Introduction –Intrinsic and Extrinsic semiconductors–Fermi level (qualitative)– Carrier generation and recombination–Carrier transport: Diffusion and Drift–Hall Effect and its applications–Direct and indirect band gap semiconductors –p-n junction, Band diagram and Working principle –LED – Solar cell.

TEXT BOOKS

1) M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11thEdition 2019.
2) R. K. Gaur and S.C. Gupta, "Engineering Physics", DhanpatRai Publications, New Delhi.

REFERENCES

1) "Concepts of Modern Physics", Arthus Beiser Tata Mc Graw Hill Publications, New Delhi.
2) "Physics Volume – II", Resnick, Halliday and Krane, Wiley, New Delhi.
3) "Elements of Solid-State Physics", J.P. Srivastava, PHI, 4theds.New Delhi.
4) "Semiconductor Devices: Physics and Technology" S. M. Sze, 2nd eds. Wiley.
5) "Solid State Electronic Devices" Ben G. Streetman, Sanjay Kumar Banerjee, 6th eds. PHI Learning.
6) "Electronic Devices and Circuits", 2ndeds. Reston Publishing Company, Inc., Reston, Virginia.
7) "Solid State Physics" R.K. Puri and V.K. Babber, S. Chand Publishing,

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I B.Tech, II-Sem(ECE)

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(A0502202) DATA STRUCTURES

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To make students aware about structures and unions in C language.
- To provide exposure on various searching and sorting techniques.
- To provide exposure on various data structures like stacks, queues, circular queues and linked lists etc.,
- To develop solutions for various problems by using C Programming.

COURSE OUTCOMES:

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

- Develop programs with user defined data types.
- Apply various file handling techniques for better data management
- Apply stacks in various applications
- Apply queues in various applications and distinguish between stacks and queues.
- Analyse various dynamic data structures.
- Implement various searching and sorting techniques

MAPPING OF COs & POs:

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

UNIT I

Pointers: Pointer variable and its importance, Pointer variable declaration, initialization of pointer variables, how to access a value from a memory location through it‘s pointer variable. Arithmetic operations on pointer variables, Scale factor length. Pointers and functions - pointers as function arguments (i.e., call-by-reference), Pointers and Arrays, Pointers and Strings, Generic Pointers.

Learning Outcomes: Student should be able to

1) Explain different types of pointers and their usage. (L2)
2) Understand, solving of arithmetic operations on pointer variables (L2)
3) Apply pointers on functions, arrays and strings (L4)

UNIT II

Structure and Unions in C Language: Structures – Introduction, Features of Structures. Declaration and Initialization of Structures, Accessing structure members, structure initialization. Nested Structures, Array of Structures, Arrays within structures and Pointers to Structures, Structures and Functions, Unions, typedef. Example Programs on the topics mentioned above.

Learning Outcomes: Student should be able to

1) Use Structures and Unions in applications using C programming. (L3)
2) Apply the structures and union concepts to solve real world problems. (L2)

UNIT III

Introduction to Data Structures: Classification of data structures, dynamic memory allocation functions in C language. **Stacks:** Definition, Various representation methods, operations on stacks and their implementation in C language, applications of stacks.

Learning Outcomes: Student should be able to

1) Apply the concepts of Data structures to solve the real-world problems (L4)
2) Understand the concepts of Stacks and also its applications (L2)
3) Describe the operations of Stacks. (L2)

UNIT IV

Queues: Definition, Various representation methods, operations on queues and their implementation in C language, applications of queues. Circular queues- operations on circular queues and their implementation in C language.

Learning Outcomes: Student should be able to

1) Understand the concepts of Queues and also its applications (L2)
2) Describe the operations of Queues. (L2)

UNIT V

Linked Lists: Definition, Various representation methods, operations on linked lists and their implementation in C language.

Learning Outcomes: Student should be able to

1) Understand the concepts of Linked list (L2)
2) Use the linked lists in various operations. (L3)

UNIT VI

Searching and Sorting Techniques: Searching Techniques - Linear search and Binary Search Techniques. Sorting techniques - Bubble Sort, Selection Sort, Insertion Sort. Implementation of all the above-mentioned techniques in C language and trace them by giving different test data.

Learning Outcomes: Student should be able to

1) Design the different sorting techniques (L6)
2) Use Linear search and Binary search methods. (L3)

TEXT BOOKS:

1) PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2) B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016

REFERENCE BOOKS:

1) Byron Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, TATA McGraw-Hill.
2) M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3) A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4) Rajaraman V., "The Fundamentals of Computers", 4th Edition, Prentice Hall of India, 2006.
5) R S Bichker, "Programming in C", University Press, 2012.

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I B.Tech, II-Sem(ECE)

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(A0204202) NETWORKS ANALYSIS
For Branch: ECE Only

COURSE OBJECTIVES:
- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their inter relationship.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Acquire the Knowledge on basic electrical quantities such as voltage, current, power etc.
- Determine the unknown quantities by using theorems, KVL, KCL etc.
- Analyse the circuit using different theorems like thevinen's, Nortons, Maximum Power Transfer, Millman theorems.
- Analyse the transient response of dc and ac circuits.
- Obtain the network parameters for the given circuit

MAPPING OF COs & POs:

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

UNIT-1
Introduction to Electrical Circuits: Review of R-L-C parameters and their V-I relations, Energy sources - Ideal, Non-ideal, Independent and dependent sources, Kirchhoff's laws. Network reduction techniques: Series-to-parallel, parallel-to-Series, Star–to-Delta or Delta-to-Star Transformations, Source transformation technique-illustrative Problems.

UNIT-2
Mesh analysis and Nodal analysis problem solving, Super node and Super mesh analysis using DC (including Dependent sources).

UNIT-3
Network Theorems (Without Proofs): Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Millman theorem, Tellegens Theorem, Compensation theorem - problem solving using dependent sources, Principle of Duality and dual networks.

UNIT-4
Transient Analysis: 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, nonhomogeneous, problem-solving using R-L-C elements with DC excitation and AC excitation, Solutions using Laplace/differential equations methods.

UNIT-5

Coupled Circuits: Introduction, Self-inductance, Mutual inductance, Dot Convention rule, co-efficient of coupling, Analysis of multi winding coupled circuits, series & parallel connection of coupled inductors.

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 type of Anti-resonance circuit (resistance present in both branches).

UNIT-6

Two Port Networks: Two Port Networks, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, Condition for reciprocity and symmetry.

TEXT BOOKS:

1) C. K. Alexander and M. N. O. Sadiku, "Fundamentals of Electric Circuits", 4th Edition, McGraw Hill Education.
2) W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", 8th edition, McGraw Hill Education.

REFERENCES:

1) M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2) D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998.
3) Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
4) Joseph Edminister and Mahmood Nahvi, "Electric Circuits", Schaum's Outline Series, Fourth Edition, Tata McGraw Hill Publishing Company, New Delhi, 2003.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, II-Sem(ECE)

T	P	C
1	4	3

(A0301201) ENGINEERING DRAWING

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Understand and appreciate the importance of basic concepts and principles of Engineering Drawing
- Realize and appreciate the importance of engineering drawing as a medium of communication to covey ideas in engineering field
- Enable the students to be aquatint with various basic engineering drawing formats
- Learn to take data and transform in to graphic drawings.

COURSE OUTCOMES:

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

- Understand the conventions and the methods adopted in engineering drawing.
- Understand the concepts of orthographic projection.
- Improve their visualization skills and to apply these skill in developing new products
- Improve technical communicative skills in the form of communicative drawings

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	2	2	3	2	-	3	2	3	2
CO2	3	2	3	2	3	-	-	2	2	3	-	-	3	2	2	2
CO3	3	2	2	1	3	-	-	2	2	3	-	1	1	2	2	2
CO4	3	2	2	2	3	-	-	2	2	3	1	-	1	2	3	2

UNIT I

Geometrical Constructions: Polygons-Construction of Regular Polygons using given length of a side; Conic sections- Ellipse- Arcs of Circles and Oblong Methods, Construction of Parabola and Hyperbola by eccentricity method only.

UNIT II

Projection of Points and Lines: Introduction to Orthographic Projections- Projections of Points-Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane, inclined to both planes, determination of true lengths, angle of inclinations.

UNIT III

Projections of Planes: Regular Planes, Plane Perpendicular to one plane and Parallel to another Reference plane, Plane inclined to one Reference Plane.

UNIT IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis perpendicular to one plane and parallel to the reference plane, Plane inclined to one reference Plane only.

UNIT V

Section of solids: Sectioning of prism, pyramid, cone and cylinder– sectional view – true shape. Solids in simple position and cutting plane inclined to one reference plane only.

Development of surface of solids: Development of truncated prism, pyramid, cone and cylinder – frustum of cone and pyramid.

UNIT VI

Orthographic and Isometric Projections: Introduction to Isometric projections/ views,

Construction of Isometric view/ projections of simple solids. Conversion of Isometric Views to Orthographic Views/Projections-Conversion of Orthographic Views to Isometric Projection/ Views.

TEXT BOOK:

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications, 2011
2) Engineering Drawing by N.D. Bhatt, Chariot Publications,2014

REFERENCE BOOKS:

1) Engineering Drawing, B.V.R Gupta, J.K. Publishers,2008
2) Engineering Drawing and Graphics, Venugopal /New age publications,2007
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers,2009
4) Engineering Drawing, Johle, Tata Mc Graw – Hill, 2008
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai, 2006.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, II-Sem(ECE)

L	T	C
2	0	0

(A0010202) ENVIRONMENTAL SCIENCE

(Mandatory Learning Course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Environmental education should have an interdisciplinary approach by including physical, chemical, biological as well as socio-cultural aspects of the environment. It should build a bridge between biology and technology.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand environmental problems arising due to developmental activities.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the natural resources and suitable methods for conservation of environment.
- Identify the environmental pollutants and abatement devices.
- Adopt practices that help in promoting balance in nature by making judicious utilization of recourses.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE

Environment -Definition, Scope, Importance and Need for public awareness. Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere).

UNIT II RESOURCES AND UTILIZATION

Renewable and Non-renewable resources.

a) Natural Resources: Soil &Water sources (conflicts of over utilization of water Resources - Hydro power project-problems), forest & mineral resources – Utilization-problems.
b) Non-conventional resources of energy(Solar Energy, wind energy and their applications)

UNIT III

a) **CONCEPTS OF ECOSYSTEM**
   Structure and functions of an ecosystem: Producers, Consumers and Decomposers-Interaction between biotic and abiotic factors in an ecosystem- Trophic levels- Food chain- Food web –Ecological Pyramid.
b) **TYPES OF ECOSYSTEMS**
   Understanding the types of ecosystem: (i) Terrestrial (forest)(ii) Aquatic – (Marine)

UNIT IV BIODIVERSITY

Introduction – Definition – Value of biodiversity- Biodiversity at global, National and Local levels-India as a mega diversity nation-Hot-spots of biodiversity-Threats to biodiversity- IUCN Red data book - Conservation of bio diversity (Insitu and Exsitu conservation methods).

UNIT V ENVIRONMENTAL POLLUTION

Introduction- Causes, effects and control measures of

a) Air pollution b) Water pollution c) Soil pollution d) Noise pollution
e) Plastic pollution

Disaster management: Floods, Earthquake.

UNIT-VI

HUMAN POPULATION ISSUES

a) Demography-problems related to Population explosion - Age Structure - Family welfare and family planning programme
b) Diseases - AIDS, Malaria, COVID, Cancer.
c) Human rights, Fundamental duties and Value of education.

ENVIRONMENTAL ISSUES

a) Climatic changes b) Greenhouse effect and global warming.
b) Ozone layer depletion. c) Acid rain.

TEXT BOOKS:

1) Deswal, S and Deswal A., (2004), A Basic Course in Environmental Studies, Dhanpat Rai & Co. Delhi.
2) Anubha Kousik and C P Kousik., New age international publishers.

REFERENCES:

1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
3) Ahmedabad –380 013, India, email: mapin@icenet.net (R)
4) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, II-Sem(ECE)

T	P	C
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(A0592201) ENGINEERING WORKSHOP & IT WORKSHOP

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

ENGINEERING WORKSHOP

COURSE OBJECTIVES:

- To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.

COURSE OUTCOMES:

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

- A student should know the basic knowledge of various tools and their use in different sections of manufacturing such as fitting, carpentry, tin smithy, welding etc. and basic engineering practices such as plumbing, electrical wiring, electronic circuits, machine shop practice.
- Ability to design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit.
- Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder.
- Ability to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	2	2	1	-	-	-	2	-	2	1	1	-	-
CO2	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO3	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO4	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-

Note: At least two exercises should be done from each trade.

1. TRADES FOR EXERCISES:

A] Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

B] Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

C] House Wiring

1. Parallel / Series Connection of two/three bulbs
2. Stair Case wiring
3. Tube Light Wiring
4. Measurement of Earth Resistance/Go down Wiring

D] Tin Smithy

1. Rectangular Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

E] Welding

1. Single V butt joint
2. Lap joint
3. Double V butt joint
4. T fillet joint.
5. Gas Welding

F] Soldering

1. Soldering & Desoldering Practice
2. Series Circuit
3. Parallel Circuit

2. TRADES FOR DEMONSTRATION:

a) Plumbing b) Machine Shop c) Bosch Power Tools

REFERENCE BOOKS:

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2013
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas, 2009
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 1999.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IT WORKSHOP

COURSE OBJECTIVES:

- The modules include training on PC Hardware, and Productivity tools including text processor, spread sheet, presentation tools. It enables the students to understand and fix the common hardware, software issues & makes the students to install either Windows or UNIX based Operating system in the machines.
- Enable students to understand how computers work, different types of computers, functions of applications, input and data storage devices, different operating systems,
- It makes the students to understand and use the common office suite tools like word, excel etc. effectively in their daily usage.

COURSE OUTCOMES:

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

- PC Hardware- introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer. The students should work on working PC to disassemble and assemble to working condition.
- To do installation of system software like MS Widows and Linux and the required device drivers.
- Productivity tools- module would enable the students in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools.

MAPPING OF COs & POs:

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

PC HARDWARE

Exercise 1 - Identify the peripherals of a computer, components in a CPU and its functions.
Exercise 2 - Every student should disassemble and assemble the PC back to working condition.
Exercise 3 – Every student should individually install MS windows on the personal computer and also install Linux as dual boot with Windows.

OFFICE TOOLS

Exercise 4 - Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office equivalent tool word: Importance of LaTeX and MS office tool Word as word Processors, Details of the four tasks and features that would be covered in each. Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1-Task III: Using Word Processor to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

SPREAD SHEET

Exercise 5–Spread Sheet Orientation: The mentor needs to tell the importance of MS office 2007,2010/ equivalent tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1-Task III: Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Formulas, Functions

PRESENTATION

Exercise 6 -Students will be working on basic presentation utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

REFERENCES:

1) Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2) LaTeX Companion – Leslie Lamport, PHI/Pearson.
3) Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4) Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5) Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6) IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I B.Tech, II-Sem(ECE)

T	P	C
0	3	1.5

(A0093201) ENGINEERING PHYSICS LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- The laboratory should help the student to develop a broad array of basic skills and tools of experimental physics and data analysis.
- The laboratory should help students to understand the role of direct observation in physics and to distinguish inferences based on theory and the outcomes of experiments.
- To learn about the optical experiments in establishing the fundamentals in Interference and Diffraction phenomena which will be visualized with the light and laser experiments mentioned in the syllabus.
- To learn about the basic electronic experiments such as energy band gap determination, Hall Effect to know the type of extrinsic semiconductors, Stewart-Gee's experiment in field intensity determination and Solar I-V characteristics.

COURSE OUTCOMES:

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

- Operate optical instruments like microscope and spectrometer
- Estimate the wavelength of different colors using diffraction grating
- Study the variation of intensity of the magnetic field due to circular coil carrying current with distance
- Identify the type of semiconductor (i.e., n-type or p-type) using Hall Effect

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS (Any10 Experiments)

1) Determination of radius of curvature of a given plano-convex lens using Newton's rings method.
2) Determination of thickness of a thin wire/film by Wedge shape method.
3) Determination of wavelength of spectral lines using Transmission Grating and Spectrometer.
4) Determination of wavelength of a sodium light by normal incidence method.
5) Determination of dispersive power of a prism using spectrometer.
6) Determination of wavelength of a laser using transmission grating.
7) Determination of particle size by laser diffraction.
8) Determination of numerical aperture of an optical fiber.
9) Study of variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's method.
10) Determination of rigidity modulus of a given wire using Torsional Pendulum.
11) Determination of energy band gap of a Si or Ge semiconductor by Four probe method.
12) Study of B – H Curve of a ferromagnetic material.
13) Determination of carrier density and Hall coefficient or magnetic flux density of an extrinsic semiconductor using Hall Effect.
14) Study current (I) and voltage (V) characteristics of a Solar Cell.
15) Measurement of Curie temperature of a given ferroelectric material by studying the temperature dependence of dielectric constant.

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I B.Tech, II-Sem(ECE)

T	P	C
0	3	1.5

(A0593202) DATA STRUCTURES LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To understand how to use structures and unions as a compound data types
- To understand various basic file operations
- To understand various stack and queue operations
- To understand various linked list operations
- To understand basic searching and sorting techniques

COURSE OUTCOMES:

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

- Develop applications on user defined data types
- Apply dynamic memory allocation through pointers
- Use different data structures for create/update basic data files
- Implement linear data structures through stacks and queues
- Implement various searching and sorting techniques, Linked lists.

MAPPING OF COs & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:

Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1

a) Write a C Program to perform various arithmetic operations on pointer variables.
b) Write a C Program to demonstrate the following parameter passing mechanisms:
   i) Call-by-value ii) Call-by-reference

EXERCISE 2

a) Write a C Program to copy the contents of one structure variable to another structure variable.
b) Write a C program to implement nested structure to store and display the student information. The structure student contains the field‘s S.no, name, and date. Date is the nested structure and it contains the fields day, month and year.

EXERCISE 3

a) Write a C program to add two distances which is in feet and inches
b) Write a C program to illustrate passing the whole structure as argument to a function.

EXERCISE 4

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

a) Reading a complex number
b) Writing a complex number
c) Addition of two complex numbers
d) Multiplication of two complex numbers (Note: represent complex number using a structure.)

EXERCISE 5

a) Write a C program to implement Union Concept.
b) Write a C program which copies last 'n' characters from one file to another.

EXERCISE 6

Write a C program to implement the following operations on Stack using array representation

a) Push b) Pop c) Display

EXERCISE 7

Write a C program to implement the following operations on Queue using array representation

a) Insert b) Delete c) Display

EXERCISE 8

Write a C program to implement the following operations on Singly Linked list using linked representation

a) Insert b) Delete c) Display d) Search

EXERCISE 9

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order.

a) Bubble sort b) Selection sort c) Insertion sort

EXERCISE 10

Write C program to implement the following searching methods to search an element in a given list of integers

a) Linear Search b) Binary Search

REFERENCE BOOKS:

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Higher Education
2) Computer programming and Data Structures, E.Balaguruswamy, Tata McGrawHill. 2009 revised edition.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.

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AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech, I-Sem(ECE)

L	T	C
2	1	3

(A0016203) VECTOR CALCULUS & COMPLEX VARIABLES

COURSE OBJECTIVES:

- To familiarize the concepts of vector calculus and complex variables.
- To equip the students to analyse vector differentiation and the evaluation of line, surface and volume integrals and their applications in electromagnetic theory, transmission lines etc..

COURSE OUTCOMES:

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

- Understand the concept of vector differentiation and vector integration and solving various line, surface integrals by using vector integral theorems.
- Understand about vector differentiation and its applications in Electromagnetic theory.
- Apply the concept of vector integration to solve many problems in field theory, Electromagnetic theory and transmission lines.
- Familiarize the complex variables and to analyse the importance of Cauchy – Riemann equations in engineering.
- Identify Residue theorem to solve some real definite integrals and its use in control theory and electro-magnetic engineering

MAPPING OF COs & POs:

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

UNIT I

Vector Differentiation: Introduction of Vector differentiation– Scalar and vector point functions – Gradient of scalar function– Directional derivatives – Divergence of a vector function – Curl of a vector function – Properties of Grad, Div and Curl.

UNIT II

Vector integration: Line integral - Potential function – Area, Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss Divergence Theorem (excluding their proof), Verification of Green's, Stoke's and Gauss Theorems.

UNIT III

Complex Variables: Continuity – Differentiability – Analyticity of Complex functions – Cauchy – Riemann equations in Cartesian and polar coordinates. Milne – Thompson method. Elementary functions of a complex variable.

UNIT IV

Complex Integration: Line integral – Evaluation along a path by indefinite integration- Cauchy's Integral Theorem – Cauchy's Integral Formula.

UNIT V

Complex Power Series: Expansions in Taylors series – Maclaurin's series and Laurent series expansions.

UNIT VI

Singular point – Isolated singular point – pole of order m – Removable – Essential singularity.

Residue – Evaluation of residue – Cauchy's Residue theorem – Evaluations of real definite integrals of the type (i) $\int_0^{2\pi} F(\text{Sin}\theta,\ \text{Cos}\theta)d\theta$ (ii) $\int_{-\infty}^{\infty} f(x)dx$. Conformal Mapping – Bi-linear (Mobius) transformation.

TEXTBOOKS

1) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol - 1, S. Chand & Company.
2) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics – III, S. Chand & Company.
3) R.K.Jain and S.R.K.iyngar, Advanced Engineering Mathematics, Alpha science International limited, 2016.

REFERENCES:

1) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
2) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
3) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010

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AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech, I-Sem(ECE)

L	T	C
2	1	3

(A0403203) ELECTRONIC DEVICES AND CIRCUITS

COURSE OBJECTIVES:

- To understand the basic materials used for fabrication of different semiconductor devices.
- To understand construction details, principle of operation and equivalent electrical model of each device.
- Evolution of different diodes based on doping levels.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand and analyse the principle of operation and equivalent electrical model for semiconductor devices like PN diode, Zener diode.
- Understand and analyse the principle of operation and equivalent electrical model for semiconductor devices like BJT, JFET, MOSFET.
- Apply the property of junction diode in rectifiers and regulators.
- Obtain the Q point for various biasing techniques.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO11	PO11	PO11	PSO1	PSO2	PSO3
CO1	3	2											2	2	
CO2	1	3											2	3	
CO3	2		3										1	2	1
CO4		2	3										2	1	

UNIT I

Semiconductor Diode: Open circuited PN junction, Current components in a PN diode, Diode Equation and its mathematical derivation, Volt-Ampere Characteristics, Energy band diagram of PN diode, Temperature dependence of Volt-Ampere Characteristics, Diode resistance (Static and Dynamic resistance), Transition capacitance, Diffusion capacitance, Step graded and linear graded junction. Avalanche breakdown, V-I Characteristics of Zener diode, Zener breakdown.

UNIT II

Diode Applications: Diode as switch – Forward recovery and reverse recovey times of a diode, Rectifier – Half wave and Full wave rectifier, Bridge rectifier, Ripple factor, PIV. **Filters**: Inductor and Capacitor, L-Section and Π-Section Filters, Zener diode as voltage regulator, brief introduction to Clipping and Clamping circuits.

UNIT III

Bipolar Junction Transistor (BJT): Transistor – Structure, Current components and their relationship, PNP and NPN transistors - Active mode of operation, Symbols and conventions, Transistor equations, Transistor as an amplifier, input and output characteristics of Common Base, Common Emitter and Common collector configurations. DC analysis of Common Base, Common Emitter and Common collector circuits.

UNIT IV

BJT Biasing: Load line and modes of operations, Operating point, Bias stability, Fixed bias, Self-bias, Stabilization against variations in I_{co}, V_{BE}, β, Bias compensation, Thermal runaway, Condition for thermal stability, Problem solving. Applications: As a Switch and definitions of switching times, as an Amplifier.

UNIT V

Field-Effect Transistors (FET): Structure, principle of operation and V-I characteristics of n-channel and p-channel Junction Field Effect Transistors (JFET), Problem solving.

Metal Oxide Semiconductor Field-effect Transistor (MOSFET): Structures, MOSFET current equation and V-I characteristics. n-channel MOSFET: Enhancement mode and Depletion mode**.** p-channel MOSFET: Enhancement mode and Depletion mode. MOSFET symbols and conventions, Complementary MOSFETs (CMOSFETs) - Structure, V-I characteristics, symbols and conventions. MOSFET act as capacitor.

UNIT VI

Biasing Circuits Using MOSFETS: Different configurations using MOSFETs, load line and modes of operation, different biasing circuits (self-bias, voltage divider bias) using MOSFETs, DC Analysis of n-channel and p-channel MOSFETs (both Enhancement and Depletion modes), Problem solving. Applications: MOSFETs as switch and small signal amplifier.

TEXT BOOKS:

1) Millman's Electronic Devices And Circuits; by Jacob Millman, Christos C. Halkias, Satyabrata Jit, 4th edition, McGraw Hill Publication, June 26th 2015.
2) Electronic Devices and Circuits; by R.L. Boylestad and Louis Nashelsky, 9th Edition, Pearson, 2006.

REFERENCES:

1) Electronic Devices and Circuits; by David A Bell, Oxford Higher Education, Fifth Edition.
2) Electronic Circuits – analysis and design; Donald A Neamen, 3rd Edition, McGraw Hill (India), 2019.
3) Microelectronics; by Behzad Razavi, 2nd edition, Wiley, 2013.
4) Electronic Devices and Circuits; by Jimmie J Cathey, Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

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(A0404203) DIGITAL LOGIC CIRCUITS DESIGN

COURSE OBJECTIVES:

- Understand the different number system, its conversions and binary arithmetic.
- Know the fundamentals of Boolean algebra and theorems, Karnaugh maps including the minimization of logic functions to SOP or POS form.
- Analysis of logic circuits and optimization techniques to minimize gate count, signals, IC count, or time delay.
- To strengthen the principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.
- To fortify the documentation standards for logic designs, standard sequential devices, including counters and registers.
- To understand design of logic functions using PLDs (ROM, RAM, PAL, PLA).

COURSE OUTCOMES:

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

- Convert one number system to other number system, Performs various arithmetic operations, Classifications of different BCD codes,
- Simplify the given logical function by using Boolean algebra, k-map and tabular methods.
- Understand the concepts of PLD's (ROM/PROM, PAL & PLA).
- Design and analyse combinational and sequential logic circuits.
- Optimize combinational and sequential logic circuits.
- Design of Sequential circuits using ASM charts.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1										1	2	
CO2		3	3										1	2	
CO3		2	3									1	1		2
CO4	2	3	2									1	1	1	1
CO5	2	3										1		2	1
CO6	1	2	2									1	1	2	1

UNIT I

Number Systems, Codes and Boolean Algebra: Philosophy of number systems – complement representation of Negative numbers, Binary arithmetic, BCD addition and subtraction, Excess-3 addition, Binary codes, Error correcting and detection codes- parity codes, Hamming codes.

UNIT II

Switching Functions and It's Minimization: Fundamental postulates of Boolean algebra, Basic theorems and properties, Switching functions, Canonical and standard forms, Algebraic simplification, Digital Logic Gates, Universal Gates, Multilevel NAND/NOR realizations. K-map method, Prime-Implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime-Implicant chart.

UNIT III

Combinational Logic Design: Half adder, Full adder, Ripple carry adder, Carry look ahead generator, BCD adder, Half subtractor, Full subtractor, Encoder, Decoder, Multiplexer, De-Multiplexer, MUX realization of Switching functions, Code-converters, 2x2 and 2x3 array multipliers, Magnitude comparator, BCD to 7-segment display.

UNIT IV

Programable Logic Devices, Threshold Logic: Basic PLD's-ROM, PROM, PLA, PAL Realization of switching function using PLD's Capabilities and limitations of Threshold gate, realization basic logic gates and universal logic gates using threshold gates, analysis of simple threshold gates.

UNIT V

Sequential Circuits: Classification of sequential circuits, Basic Flip-Flops, Excitation and Characteristic Tables. Steps in Synchronous Sequential circuit design. Design of modulo-N counters, Ring and Johnson counters, Universal shift register, Serial Binary adder, Sequence Detector. FSM-capabilities and Limitations, Mealy and Moore models, Minimization of completely specified Sequential Machines using partition method.

UNIT VI

ASM Charts: Salient features of the ASM chart, components of ASM charts, difference between ASM chart and conventional flow chart, difference between ASM chart and state diagram, system design using control logic, examples sequence detector, MOD-N counter, binary multiplier.

TEXT BOOKS:

1. Switching & Finite Automata theory- ZviKohavi, TMH,2nd Edition.
2. Digital Design-Morries Mano, PHI, 3rd Edition,2006.
3. Switching Theory and Logic design-A. Anand Kumar,2008.

REFERENCES:

1. An Engineering Approach to Digital Design-Fletcher, PHI.
2. Fundamentals of Logic Design-Charles H.Roth.5th Edition, 2004, Thomson publications.
3. Digital Logic Applications and Design-John M.Yarbrough, 2006, Thomson Publications.

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(A0405203) SIGNALS AND SYSTEMS

COURSE OBJECTIVES:

- Study of signals and systems.
- Analysis of signals & systems and frequency transform methods.
- To understand the concepts of convolution and correlation.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Classification of continuous and discrete time signals & systems and sampling theorem.
- Analyze the continuous and discrete time signals using Fourier analysis.
- Concept of convolution, correlation are useful for analysis in the areas of linear systems and communication theory.
- Apply the Laplace transform and z-transform to analyze the continuous and discrete time signals.
- Analyze the signals using Hilbert transform and Band pass systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			1							1			
CO2	3	2		2	1							1		1	
CO3	2	1		2	1							1		1	
CO4	3	3		2	1				2			2		3	1
CO5	2	1		2	1				1			1			1

UNIT I

Introduction to Signals and Systems:

Continuous-time Signals: Representation of signals, Signal classification, Types of signals, Operations on signals - Scaling, Shifting, Transformation of independent variables. Sampling theorem, Nyquist rate of sampling, Effects of under Sampling-Aliasing, Anti-Aliasing filter, Ideal sampling.

Discrete-time Signals: Representation of Discrete time signals, Discrete time signal classification, Types of Discrete time signals, Operations on discrete time signals - Scaling, Shifting, Transformation of independent variables.

Continuous-time and Discrete-time Systems: Classification of systems - Static and dynamic, Linear and non-linear, Time-variant and time-invariant, Causal and non-causal, Stable and unstable.

UNIT II

Fourier analysis of Continuous-time Signals: Introduction to Fourier series, Gibbs Phenomenon, Continuous-time Fourier transform (CTFT), Existence, Properties, Magnitude and phase response, Parseval's theorem, Inverse Fourier transform.

UNIT III

Fourier analysis of Discrete-time Signals: Discrete-time Fourier transform, Properties, Inverse discrete-time Fourier transform, Comparison between CTFT and DTFT.

UNIT IV

Convolution and Correlation: Continuous-time convolution, Convolution sum, Correlation between signals, Cross correlation, Autocorrelation, Energy spectral density, Power spectral density.

UNIT V

System analysis using Laplace Transform: Relation between Laplace and Fourier transforms,
Properties, Inverse Laplace transform, Solution to differential equations using Laplace transform,
Region of convergence, Stability analysis.

System Analysis using z-Transform: Z-transform, Properties, s-plane to z-plane mapping, Inverse z-transform, Solution to difference equations using Z-transform, Region of convergence, Stability analysis**.**

UNIT VI

Hilbert transform: Introduction, Properties of Hilbert transform, Applications of Hilbert transform, Pre-Envelope and Band pass signals and Band pass systems and Phase and group delay.

TEXT BOOKS:

1) Signals and Systems, second edition-P. Rama Krishna Rao and Shankar Prakriya- Mc-Graw Hill, 2013.
2) Signals and Systems - A V Oppenheim A S Willsky with S Hamid Nawab, Publisher: Prentice Hall; 2nd Edition, 2011.
3) Communication systems - Simon Haykin,2nd edition, John Wiley& Sons, 1983.

REFERENCES:

1) Signal processing and linear systems- B. P. Lathi, Oxford university press,2009
2) Signals & Systems - Simon Haykin, Barry Van Veen, Signals and Systems, 2nd edition, John Wiley& Sons, 2003.
3) Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.

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(A0017203) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

For branches: CE, EEE & ECE

COURSE OBJECTIVES:

- To impart the students with fundamental concepts of economics, budgeting and accounts and its relevance in business management.

COURSE OUTCOMES:

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

- Identify managerial problems with optimum solutions.
- Analyse the demand factors on a product that may be existed/new.
- Know various methods of Demand forecasting
- Understand different business organizations.
- Know techniques and evaluation of capital budgeting.
- Understand financial performance through financial statements

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	2	1											
CO2				1	2										
CO3				2			2								
CO4								1	2	2					
CO5		3	2	1	1										
CO6										1	3				

UNIT I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics- relation with other disciplines- Demand Analysis: Demand Determinants, Law of Demand and its exceptions

UNIT II

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand forecasting, factors governing demand forecasting, methods of demand forecasting (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting)

UNIT III

Types of Business Organizations and New Economic Environment: Characteristic features of business, features and evaluation of sole proprietorship, partnership, Joint Stock Company, public enterprises and their types, changing business environment in post-liberalization scenario.

UNIT IV

Capital and Capital Budgeting: Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposal, methods of capital budgeting – payback method, accounting rate of return (ARR) and Net present value method (Simple problems).

UNIT V

Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT VI

Financial Analysis Through Ratios: Computation, Analysis and Interpretation of financial statements through Liquidity Ratios (Current and Quick ratio), Activity ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt- Equity Ratio, Interest Coverage Ratio) and Profitability ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratios and EPS), Du Pont Chart.

TEXT BOOKS:

1. Management Economics and Financial Analysis, Aryasri, 4/e, TMH, 2009.
2. Managerial Economics, Varshney & Maheswari, Sultan Chand, 2009.

REFERENCES

1. Financial Accounting and Analysis, Premchand Babu, Madan Mohan, Himalaya, 2009
2. Managerial Economics and Financial Analysis, S.A. Siddiqui, and A.S. Siddiqui, New Age
3. Principles of Business Economics, Joseph G. Nellis and David Parker, 2/e, Pearson.
4. Managerial Economics in a Global Economy, Domnick Salvatore, Cengage, 2009.
5. Managerial Economics, H.L.Ahuja, 3/e, S.Chand, 2009

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(A0012203) DESIGN THINKING AND INNOVATIONS

(Skill Development Course)

For branches: CE, EEE, ME, ECE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To create awareness of design thinking among students of engineering
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To instil a sense of significance towards applying creativity to product and service design
- To motivate students to apply design thinking while implementing a project focusing on local or global societal problems

COURSE OUTCOMES:

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

- Identify design principles from an engineering perspective
- Cultivate sensitivity towards design aspects of Activities, Environments, Interactions, Objects, and Users (A-E-I-O-U) in daily life.
- Validate problem statements through user empathisation with societal and environmental consciousness.
- Devise visual design and documentation to communicate more effectively.
- Develop project management skills in a multidisciplinary environment

STUDENTS' RESPONSIBILITIES:

1. Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
2. Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
3. Identifying general societal and social problems that may be effectively addressed using design thinking principles
4. Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

UNIT-I

Introduction, what is design thinking, the traditional model of innovation, The model of design thinking, Design thinking is not old, Design thinking is to innovation, The sweet spot of design thinking.

Why design thinking now?: Products & Services, Multifaceted problems, fast becoming B2C, wide spread digitization, Customer knowledgeable, Clash of business models, Challenging markets.

UNIT – II

Key tenets of Design thinking, Human centric, Focus on subject not object, Problem solving with the customer not for the customer, Thinking beyond products, Striking balance, Think Broad, Solution Generation, validation, root causes, What else, visualize your thinking, Fail often.

Inspire: Create a stretch, Get the design brief right, Adopt the power of metaphors, Widen the aperture, Bring on diversity, The learning personas, the organizing personas, the building personas,.

UNIT - III

Empathize and Define: The traditional market research is broken, Create new channels to listen to customers, Be the customer you wish to serve, Leverage technology, Get to the customers, Do not limit empathy to customers, Engineering empathy, Mind mapping, Stake holder map, Customer journey map, Empathy map, Picking problem worth solving, Framing problem sharply, Innovating in absence of customer.

UNIT - IV

Ideate: Ideas are like Lego blocks, Hybrid brain storming, Intersection of disciplines, Imitate with grace, Braking the pattern, Challenging assumptions, Value chain, Looking beyond current users, Designing for extreme, Analogous design, Triggering ideation.

Prototype and Test: The high cost of just doing it, seeking clarity, Be quick and dirty, Manageable hypotheses, Doing last experiment first, Visualize through storyboarding and scenarios, Engaging through stories, Is dogfooding enough?, Solicit feedback, Inventory prototypes.

UNIT - V

Scale: Keep the main thing as the main thing, cut some slack, Leaders must show up, Provide 'air cover', cultivate innovation evangelists, Measure for impact, Don't confuse empathy with good business sense.

Design Thinking in action: A two day Design thinking workshop, session objectives, Ground rules, workshop flow, mentoring programme, Build your own version of design thinking programme, offer avenues to practice design thinking, think beyond, Juggad, pay attention to the physical space, trust the process

UNIT - VI

How to be a Design Thinker Live curious, Listen with intent, observe with purpose, Defer your judgement, Hone multiple affiliations, Be a T-shaped person, develop failure tolerance.

Case studies of Design thinking like Chota Cool, Indian post box, Big Bazar, Reliance, royal Enfield etc. (Any other case studies may also be considered).

TEXT BOOKS:

1. Pavan Soni, Design your thinking, Penguin Random house India, 2020.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", John Wiley & Sons (2012) (ISBN: 978-1118083468)
3. Jeanne Liedtka and Tim Ogilvie , Designing for Growth: A Design Thinking Tool Kit for Managers, Columbia Business School Publishing, E-ISBN 978-0-231-52796-5
4. B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013
5. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)
6. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)

REFERENCE BOOKS:

1. Kishore Biyani, It happened in India: The story of Pantaloons, Big Bazar, Central and the Great Indian Consumer, Rupa Publications, New Delhi, 2007.
2. V. Kasturi Rangan and Mona Sinha, Hindustan Unilever's "Pureit" water purifier, a Harvard Business School case Study, 1 February 2011.
3. Kelley and Littman, The Ten Faces of Innovation: IDEO's Strategies for Beating the Devil's Advocate and Driving Creativity Throughout Your Organization

4. Ravi Arora, Igniting Innovation: The Tata Way, Harper Business, New Delhi, 2019.
5. Ashton, How to fly a Horse: The Secret History of Creation, Invention, and Discovery.
6. Kelley, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm.
7. Rishika T. Krishnan, From Juggad to Systematic innovation: the challenge for India, The Utpreraka Foundation, 2010.
8. Eric Schmidt and Jonathan Rosenberg, How Google Works, Grand Central Publising, New York, 2014.

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(A0015203) UNIVERSAL HUMAN VALUES
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- This course is developed to design a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- The main objective of this course is to help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- To create a holistic perspective based on self-exploration
- The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
- The students are able to see that they can enlist their desires and the desires are not vague.
- To strengthen the self-reflection.
- To develop the commitment and courage to act.
- The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1	-	2	-	2	-	-	-	1	3	-	-
CO2	2	3	2	3	-	3	-	1	-	--	-	3	3	-	-
CO3	2	2	3	1	-	1	-	3	-	-	-	2	3	-	-
CO4	3	2	3	2	-	2	-	2	-	-	-	2	3	-	-
CO5	2	2	2	1	-	2	-	1	-	-	-	3	3	-	-
CO6	1	1	1	2	-	1	-	3	-	-	-	2	3	-	-

UNIT 1:
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements forfulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations

UNIT II:
Understanding Harmony in the Human Being - Harmony in Myself!
Understanding human being as a co-existence of the sentient 'I' and the material'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility,

Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correctappraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health (Practice Exercises and Case Studies will be taken up in Practice Sessions)

UNIT III:

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding Harmony in the family–the basic unit of human interaction , Understanding values in human-human relationship; meaning of Justice (*Nyaya)* (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness (*Ubhay-tripti)*; Trust *(Vishwas)* and Respect *(Samman)* as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence.

UNIT IV:

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals (Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals), Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha), Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT V:

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

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence *(Sah-astitva)* of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence, Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT VI:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

TEXT BOOK

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

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

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Publishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity, T*he Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Story of Stuff, http://www.storyofstuff.com
2. Al Gore, An Inconvenient Truth, Paramount Classics, USA
3. Charlie Chaplin, Modern Times, United Artists, USA
4. IIT Delhi, Modern Technology – the Untold Story
5. Gandhi A., Right Here Right Now, Cyclewala Productions

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(A0491203) ELECTRONIC DEVICES AND CIRCUITS LAB

For branches: EEE & ECE

COURSE OBJECTIVES:

- This Lab provides the students to get an electrical model for various semiconductor devices. Students can find and plot V_I characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices.
- Understand and analyse the applications of PN junction diode (Clipper, Clamper, Half wave rectifier and Full wave rectifier with and without filters)
- Understand the application of the Zener diode experimentally.
- Analyse the characteristics of different electronic devices such as PN diode, BJT and JFET
- Analyse the characteristics of MOSFET and CMOS inverter.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2				3				2		1
CO2	3	1	2		2				3				2	1	
CO3	3	3	2	2	1	2			3		2		2	2	
CO4	3	1	1	1		1			3				1	2	1
CO5	3	2	1	2		2			3		2		1	1	1

(For Laboratory examination – Minimum of 8 experiments)

1) PN Junction diode characteristics.
2) Zener diode characteristics and Zener as a Regulator.
3) Design a clipper circuit using PN junction diode.
4) Design a clipper circuit using Zener diode.
5) Design a clamper circuit using PN junction diode.
6) Rectifier without filters (Full wave & Half wave).
7) Rectifier with filters (Full wave & Half wave).
8) Transistor CB characteristics (Input and Output).
9) Transistor CE characteristics (Input and Output).
10) Design and verification of BJT biasing techniques
11) FET characteristics.
12) MOSFET characteristics.
13) Design and verification of MOSFET biasing techniques
14) CMOS inverter

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(A0292203) ELECTRICAL ENGINEERING LAB

COURSE OBJECTIVES:

- To conduct the experiment and verify the basic electrical principles.
- To provide practical experience in observing the performance of DC machines and Transformers.
- To study the behaviour and characteristics of different static and dynamic machines

COURSE OUTCOMES: At the end of the course, the student will be able to:

- To Understand the DC fundamentals.
- To Evaluate the Efficiency of the machine by analyzing test results.
- To identify the type of electrical machines for a given application.
- To select range of apparatus based on the type of machines.
- To understand the behaviour and characteristics of different machines.
- Verification of theoretical concepts through experimentation.

MAPPING OF COs & POs:

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

List of Experiments

1) Verification of Ohm's Law.
2) Verification of Kirchhoff's laws.
3) Verification of Resistors in series and parallel.
4) Star-delta & delta-star transformation.
5) Resistor colour coding.
6) Speed control of DC Shunt motor by Armature control method.
7) Speed control of DC Shunt motor by Field control method.
8) Load Test on DC shunt motor.
9) Load Test on DC series motor.
10) OC & SC test on 1-phase Transformer (Efficiency)
11) OC & SC test on 1-phase Transformer (Regulation)
12) Brake test on 3-Phase squirrel cage induction motor.

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(A0492203) BASIC SIMULATION LAB

COURSE OBJECTIVES:

- The main objective of the Lab is to give the introduction about all signals with the help of their characteristics using MATLAB. This lab also deals with signal processing operations to understand various systems and simulate them using MATLAB.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Generation of continuous and discrete time signals.
- Operations on different signals and sequences.
- Convolution and Correlation between signals and sequences.
- Analyze signals using Fourier, Laplace and Z-transforms.
- Verification of sampling theorem.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2			1							2	1		1
CO2	2	1										1			
CO3	2	2		2	1										2
CO4	2	2			1							2		3	
CO5	2	1		2	1							1			

LIST OF EXPERIMENTS:

1) Generation of various signals and sequences (Periodic and aperiodic). Such as unit impulse, unit step, square, saw tooth, triangular, sinusoidal, ramp, sinc function.
2) Operation on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
3) Finding the even and odd parts of signal and sequence, Energy and power of signal and sequence.
4) Write a program to find the trigonometric & exponential Fourier series coefficients of a rectangular periodic signal. Reconstruct the signal by combining the Fourier series coefficients with appropriate weightages- Plot the discrete spectrum of the signal
5) Finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum.
6) Verification of linearity and time invariance properties of a given continuous/discrete system.
7) Write a program to find magnitude and phase response of first order low pass and high pass filter. Plot the responses in logarithmic scale.
8) Convolution between signals and sequences.
9) Autocorrelation and cross correlation between signals and sequences.
10) Locating zeros and poles and plotting the pole-zero maps in S-plane and Z-plane for the given transfer functions and find the stability.

Note: All the experiments are to be simulated using MATLAB or equivalent software

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(A0504203) PYTHON PROGRAMMING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
This course will enable students to:
- Learn Syntax and Semantics of various Operators used in Python.
- Understand about Various Input, Output and Control flow statements of Python.
- Understand Strings, List, Tuple, Set and Dictionary in Python.
- Implement Object Oriented Programming concepts in Python.
- Understand Exception handling and File I/O in Python.
- Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
- Make use of Flow Control statements, Input / Output functions and Strings of Python.
- Demonstrate proficiency in handling of data structures like List, Tuple, Set and Dictionary.
- Demonstrate the use of Functions, Modules and File I/O operations in in Python.
- Interpret the Concepts of Object-Oriented Programming in Python.
- Interpret the various issues of Exception handling mechanisms and Regular Expressions in Python.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			2				1	1		1	1	1	
CO2	3	2	1		2				1	1		1	1	1	
CO3	3	3	2	1	2				1	1		2	1	2	2
CO4	3	2	1	1	2				1	1		1	1	1	1
CO5	3	3	2	1	2	1			1	1		2	2	2	2
CO6	3	3	2	1	2	2			1	1		2	2	2	2

UNIT – I:
Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Overview on Fundamental data types of Python.
Operators in Python: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Shift Operators, Ternary operator, Membership Operators, Identity Operators, Expressions and order of evaluations. Illustrative examples on all the above operators.

UNIT – II:
Input and Output statements: input() function, reading multiple values from the keyboard in a single line, print() function, 'sep' and 'end' attributes, Printing formatted string, replacement operator ({}). **Control flow statements:** Conditional statements. Iterative statements. Transfer statements.
Strings: Operations on string, String slicing, important methods used on string.

UNIT – III:
Lists: Operations on List, important methods used on list. List comprehensions

Tuples: Operations on tuples, important methods used on tuple.
Sets: Operations on sets, important methods used on set.
Dictionaries: Operations on Dictionaries, important methods used on dictionaries.

UNIT – IV:
Functions - Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions, Scope of the Variables in a Function. Recursive functions.
Modules: Creating modules, import statement, from Import statement.
File I/O: Need of files concept, Types of files, Opening and Closing a Text file, Reading & Writing operations on files, Setting offsets in a file, Traversing a Text file.

UNIT – V:
Object Oriented Programming (OOP) in Python: Classes and Objects, 'self-variable', Types of Variables and Methods used in Classes, Constructor Method, Inheritance, Overriding Methods, Abstract Classes, Data hiding.

UNIT – VI:
Error and Exceptions: Difference between an Error and Exception, Types of Exceptions, Handling Exceptions, try, except, else and finally blocks, control flow in try-except-else-finally blocks, Raising Exceptions, Customized Exceptions.
Regular Expressions: Character matching in regular expressions, extracting data using regular expressions.

TEXT BOOKS

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.
2. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018**.**

REFERENCE BOOKS

1) R.Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019Core Python Programming, 2016 W.Chun, Pearson.
2) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
3) https://www.w3schools.com/python/python_reference.asp
4) https://www.python.org/doc/

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(A0408204) ARM MICROCONTROLLER & ITS INTERFACING

COURSE OBJECTIVES:

- To study the concepts of RISC Architecture and Assembly language programming of ARM Processor
- To study the concepts of Architectural Support for High level language and memory hierarchy
- To study the concepts of Architectural support for system Development and Operating system

COURSE OUTCOMES:

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

- Understand microprocessors and Microcontrollers
- Analyse the architecture of ARM processors and Internal Features.
- Develop assembly and C programming for ARM processor (STM32).
- Understanding GPIO and interfacing various devices.
- Develop societal applications using CAN and I2C protocols.

MAPPING OF COs & POs:

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

UNIT I: Introduction

Introduction to Microprocessor and Microcontrollers, Differences between microprocessor and microcontroller, Different types of Microcontrollers.

ARM Micro-controller: History and Features, Importance of 32-bit Microcontrollers, Introduction to ARM, Difference between ARM & MIPS, Brief description of ARM Family Microcontrollers, Introduction to ARM Cortex M Series (M0 & M3),Description of STM32Fxxx Microcontrollers (STM32F0xxx & STM32F1xxx)

UNIT II: Architecture description of ARM

Pin Diagram, Memory Organization, SFRs description, Introduction to general microcontroller terms, Program Counter, Accumulator (or Working Register), Reset, Clock Cycle, Machine Cycle, Instruction Cycle, Interrupts, SFRs & GPRs, Stack, Stack Pointer, Stack Operation, *Internal features:* General Purpose Input-Output PORTs, Interrupt, Timers, Analog to Digital Convertors, USART, EEPROM, Device Protection features – Watchdog Timer, BOR, Power up Timer

UNIT III: ARM Programming

Arithmetic and Logic Instructions, Branch, Call, and Stack in Arm, Signed Integer Numbers Arithmetic, ARM Addressing Modes; Embedded C Programming.

UNIT IV: Interfacing of GPIO and Basic Internal Peripherals of ARM (STM32F103) Controller

LED Interfacing with Microcontroller, LED Patterns programming, switches Interfacing with Microcontroller, Interfacing of Solid State Devices with Microcontroller, Programming concept of SSD, Interfacing of Keypad with Microcontroller, Programming Concept of Keypad Matrix, Liquid crystal display, Understanding the Timer/Counter Concepts, Introduction to

Timer2 & Timer3 Concepts, Introductions to Timer SFRs and their access, Programming concept of Timers to Generate delays.

UNIT V: Programming of Advanced Internal Peripherals of STM32Fxxx Controller

ADC*:* Introduction to ADC Process, Need of ADC, ADC Resolutions & Relation between Vin & Digital Output, Introduction to STM32Fxxx, internal ADC and its SFRs, Programming Concept of ADC.

DAC*:* Concept & Description to STM32Fxxx DAC, Description to SFRs & their Access, Programming Concept of DAC.

UART*:* Introduction to Serial & Parallel Communication, Introduction to Synchronous & Asynchronous Communication, Introduction to UART and its SFRs, Programming concept of Serial Transmitter & Receiver using UART.

UNIT VI: Interrupts and Applications with STM32Fxxx

Interrupts: Introduction to Interrupt, Polling Vs. Interrupt, Types of Interrupts (Maskable & Non-Maskable, Internal & External), Description to NVIC Interrupt Logic Diagram of STM32Fxxx, Introduction to SFRs related to Interrupts, Programming Concept of Interrupts.

Applications: Design and development of a closed loop system for health applications, Agriculture applications, Automobile applications, Domestic applications including design of signal conditioning circuits and programming, Robotic applications, Motors (PMDC, Stepper & Servo) and utilisation CAN, I^2C and SPI protocols.

TEXT BOOKS:

1) Sarmad Naimi, Muhammad Ali Mazidi, Sepehr Naimi, The STM32F103 Arm Microcontroller & Embedded Systems: Using Assembly & C, MicroDigitalEd publishing, 2020
2) Shujen Chen, Muhammad Ali Mazidi, Eshragh Ghaemi, STM32 Arm Programming for Embedded Systems: Using C Language with STM32 Nucleo, MicroDigitalEd., 2018.
3) Geoffrey Brown, Discovering the STM32 Microcontroller, Indiana University, 2016

REFERENCE BOOKS:

1) Warren Gay, Beginning STM32: Developing with FreeRTOS, libopencm3 and GCC, Apress, 2018
2) Kirk Zurell, C Programming for Embedded Systems, Lawrence, Kansas : R&D Books, 2000.
3) STM32F discovery datasheets, reference manuals & Application notes.
4) Anbazhagan K, Ambika Parameswari K, Programming STM32 Microcontroller circuit
5) STM32 Microcontroller, Keil uVision and STM32CubeMX, ESP8266 with STM32F103C8,Stepper & Servo Motor with STM32F103C8, Heartbeat Moduation.
6) Cortex M3 Reference manual
7) Joseph Yiu, The Definitive Guide to the ARM Cortex M3, Newnes, 2007
8) WANG YONG HONG, XU WEI, HAO LI PING, STM32 family of ARM Cortex-M3 Microcontrollers Principles and Practice
9) Carmine Noviello, Mastering the STM32 Microcontroller, Leanpub, 2016

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II B.Tech, II-Sem(ECE)

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(A0409204) ELECTRONIC CIRCUITS – ANALYSIS AND DESIGN

COURSE OBJECTIVES:

- To study the analysis and design of single stage and multistage amplifiers at low and high frequencies.
- Electrical equivalent model of transistor at low and high frequencies.
- Study of small signal and large signal amplifiers and their area of applications.
- To understand the concepts of feedback and their applications (Voltage feedback amplifiers and oscillators)

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Design and analyse single stage amplifiers using BJT and MOSFET at low frequencies.
- Design and analyse multi stage amplifiers using BJT and MOSFET at low frequencies.
- Discuss frequency response of single stage BJT and MOSFET amplifiers at low and high frequencies.
- Explain effect of negative feedback on amplifier characteristics.
- Discuss basic principles for analysing RC & LC oscillator circuits using BJT and MOSFET.
- Design and analyse different types of large signal amplifiers.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2		1							1	3	1	
CO2	2	2			2							2	3	2	
CO3	2	3	2	2	1							2		2	1
CO4	1	3	2	2								1	1	2	1
CO5	3	1	2		1							2		2	1
CO6	2	1	2	2	1								2	1	1

UNIT I

Small Signal Analysis of BJT: Basic CE amplifier circuit, Circuit with Emitter resistance, AC load line analysis, Small signal analysis-input and output impedances, Voltage gain, Current gain of CE,CB, CC amplifiers using h-parameter model and simplified model, Problem solving.

Small Signal Analysis of MOSFETs: Graphical and Load line analysis, small signal parameters, small signal equivalent circuit, small signal analysis of Common source, Common drain, Common gate amplifiers, Comparison of the three basic amplifier configurations, Problem solving.

UNIT II

Differential and Multistage Amplifiers: The MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, Other Non-ideal Characteristics of the Differential Amplifier, The Differential Amplifier with Active Load, Multistage Amplifiers – RC coupled amplifier – Darlington pair – Cascade amplifier, Problem solving.

UNIT III

Frequency Response: Introduction, Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, Useful Tools for the Analysis of the High-Frequency Response of Amplifiers, A Closer Look at the High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascade Amplifiers, High-

Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers, Other Wideband Amplifier Configurations, Multistage Amplifier Examples, Problem solving.

UNIT IV

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Transconductance Amplifier, The Feedback Trans resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary of the Feedback Analysis Method, Determining the Loop Gain, Problem solving.

UNIT V

Power Amplifiers: Introduction, Classification of Output Stages, Class A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, IC Power Amplifiers, MOS Power Transistors, Problem solving.

UNIT VI

Oscillators and Tuned Amplifiers: Oscillators: General Considerations, Classification of Oscillators, LC Oscillators using BJT and FET-Heatly and Colpit's Oscillators, RC Oscillators using BJT and FET- Phase Shift and Wien-Bridge Oscillators, Crystal Oscillators, Illustrative Problems.

Tuned Amplifiers: Basic Principle, Inductor losses, use of transformers, Amplifiers with multiple tuned circuits.

TEXT BOOKS:

1) Adel S. Sedra and Kenneth C. Smith, "Micro Electronic Circuits", Oxford University Press International 6th edition, 2013.
2) Donald A Neamen, "Electronic Circuits – analysis and design", 3rd Edition, McGraw Hill (India), 2019.

REFERENCES:

1) J. Milliman and C Halkias, "Integrated electronics", 2nd Edition, Tata McGraw Hill, 1991.
2) Behzad Razavi, "Microelectronics", Second edition, Wiley, 2013.
3) R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9th Edition, Pearson, 2006.
4) Jimmie J Cathey, "Electronic Devices and Circuits," Schaum's outlines series, 3rd edition, McGraw-Hill (India), 2010.

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(A0410204) ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

COURSE OBJECTIVES:
- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures including those on the sub-micron scale.
- To provide basic laboratory exposure to electromagnetic principles and applications

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Apply knowledge of mathematics, science, and engineering to the analysis and design of systems involving electric and magnetic fields as well as electromagnetic waves.
- Identify, formulate, and solve engineering problems in the area of electric and magnetic fields and waves.
- Use the techniques, and skills, which are necessary for engineering practice.
- Acquire skills to carry out research for technical issues.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2												1	
CO2		3	1										3		
CO3	1		2											2	
CO4		1	2	3											3

UNIT I
Coordinate Systems, Cartesian coordinate system, polar coordinate system and spherical coordinate system, Vector Calculus: Curl and divergence, Vector identities, Illustrative problems.

UNIT II
Static Electric Fields: Coulomb's Law, Electric Field Intensity, Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, convection and conduction currents, Continuity Equation, Poisson's and Laplace's Equations, Illustrative Problems.

UNIT III
Static Magnetic Fields: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Force due to magnetic fields, Ampere's Force Law, Related Problems.

UNIT IV
Time Varying EM Fields: Faraday's Law of induction 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: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Pointing vector and pointing theorem, power loss in a plane conductor, Related Problems.

UNIT V
Uniform plane waves: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, Relations between E & H. Sinusoidal Variations. Wave Propagation

in Lossless and Conducting Media. Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics. Polarization types, Related Problems

UNIT VI

Transmission Lines: Types, Equivalent Electrical circuits, Transmission Line Equations, Primary & Secondary Constants, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, VSWR, Infinite Line, Distortion – Distortion less and minimum attenuation condition, Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ /2, λ /8 Lines, impudence transformations, smith chart-its configuration and applications, single stub and double stub matching.

TEXT BOOKS:

1) Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2) Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.

REFERANCES:

1) Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.
2) Electromagnetic Field Theory and Transmission Lines – G.S.N. Raju, Pearson Edn. Pte. Ltd., 2005.
3) Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2001.

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(A0411204) RANDOM VARIABLES AND RANDOM PROCESS

COURSE OBJECTIVES:

- To understand the concepts of a Random Variable and operations that may be performed on a single Random variable.
- To understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.
- To understand the concepts of Random Process and Temporal & Spectral characteristics of Random Processes.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand the concepts of random variables and their characteristics.
- Apply the concepts of probability theory to determine the statistical parameters of random variables.
- Understand the concepts of random process and their characteristics.
- Apply the concepts of random process to analyze linear systems

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													1	
CO2	1	3	1												2
CO3	3														
CO4	1	3	1												

UNIT I

PROBABILITY: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem and Independent Events. Problem solving.

RANDOM VARIABLE: Definition of a Random Variable**,** Conditions for a Function to be a Random Variable, Discrete and Continuous Random Variables, Mixed Random Variable, Distribution Function, Density function, Properties of Distribution and Density Functions, Gaussian Random Variable, Binomial, Poisson, Uniform, Exponential, and Rayleigh Random Variables, Conditional Distribution and Density Functions, and their properties, Methods of defining Conditioning Event.

UNIT II

OPERATION ON ONE RANDOM VARIABLE – EXPECTATION : Introduction, Expected Value of a Random Variable, Expected Value of a Function of a Random Variable, Conditional Expected Value, Moments about the Origin, Central Moments, Variance and Skew, Statement of Chebychev's, Markov's, and Chernoff's Inequalities (Statements only), Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations of a Continuous Random Variable, Nonmonotonic Transformations of a Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT III

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Joint Density Function, Properties of Joint Density, Marginal Density Functions, Conditional Distribution

and Density – Point Conditioning, and Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Statement only).

UNIT IV

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables, N Random Variables, Properties of Gaussian Random Variables, Transformations of Multiple Random Variables: One Function and Multiple Functions, Linear Transformation of Gaussian Random Variables.

UNIT V

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Statistical Independence, First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, N-Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Discrete-Time Processes and Sequences, Gaussian Random Processes, Poisson Random Process.

UNIT VI

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Density Spectrum and its Properties, Bandwidth of the Power Density Spectrum, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Fundamentals of Linear System, 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, System Evaluation using Random Noise, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and output.

TEXT BOOKS:

1) Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2) Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, McGraw Hill, 4th Edition, 2002.

REFERENCES:

1) Communication Systems Analog& Digital – R.P. Singh and S.D. Sapre, TMH, 1995.
2) Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition,2001.
3) Probabilistic Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.
4) Statistical Theory of Communication - S.P. Eugene Xavier, New Age Publications, 2003.
5) Signals, Systems & Communication - B.P. Lathi, B.S. Publications, 2003.

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1 2 2

(A0019203) APTITUDE ARITHMETIC REASONING AND COMPREHENSION
(Skill Development Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To familiarize the students about the concepts of aptitude, arithmetic and reasoning
- To cope up the students to improve their employable skills

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand number system which helps to become well trained for recruitment drives.
- Analyse permutations and combinations concept.
- Obtain the knowledge of coding and decoding concept.
- Understand the topics related to clock and probability.
- Identify the topics related to Venn diagrams, reasoning and Non-verbal reasoning.

MAPPING OF COs & POs:

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

UNIT I
Numbers, Number Systems, Simple Equations, Ratio, Proportion, Variation Quadratic Equations, Progressions, Percentages.

UNIT II
Profit and Loss, Partnerships, Averages, Mixtures & Allegations, Simple Interest, Compound Interest, Time and Work, Pipes, indices, surds, inequalities ,Cisterns Time and Distance Geometry and Mensuration.

UNIT III
Permutations and Combinations, Probability, Data Interpretation & Data Sufficiency.

UNIT IV
Number & Letter Series, Analogies, Coding and Decoding, Odd Man Out, Blood Relations.

UNIT V
Direction Sense, Symbols and Notations, Deductions & Connectives, Clocks, Calendars Analytical.

UNIT VI
Reasoning (Verbal and Non-Verbal), Venn Diagrams, Analytical Puzzles and Octal number system.

REFERENCES:
1) R.S.Agarwal. Quantitative Techniques. S.Chand Series.
2) Shankuntala Devi. Techniques of Reasoning. S.Chand Series.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II B.Tech, II-Sem(ECE)

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(A0571203) PYTHON PROGRAMMING LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To be able to introduce core programming basics and various Operators and flow control statements of Python programming language through proper practice.
- To demonstrate about various Python fundamental data structures such as int, float, complex, bool and strings.
- To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
- To demonstrate about Functions, Modules and File Input - Output operations in Python programming language.
- To demonstrate about Object Oriented Programming in Python Programming.
- To understand about and Exception handling mechanisms and Regular Expressions in Python Programming.

COURSE OUTCOMES:
- Student should be able to understand the basic concepts of scripting and the contributions of scripting language.
- Student should be able to explore Fundamental data structures in Python.
- Student should be able to explore python data structures like Lists, Tuples, Sets and dictionaries.
- Student should be able to explore Functions, Modules and File input – Output Operations in Python programming language.
- Student should be able to explore Object Oriented Programming in Python Programming.
- Student should be able to create practical and contemporary applications using Exception handling mechanisms and Regular Expressions.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1			1				1	1		1	2	1	1
CO 2	3	3	2		2				1	1		1	1	1	1
CO 3	3	2	2	1	2				1	1		2	1	2	1
CO 4	3	2	1		2				1	1		1	1	2	
CO 5	3	3	1	1	1				1	1		2	2	2	2
CO 6	3	3	1	1	1				1	1		2	2	2	2

S.No	Name of the Experiment
1	a) Demonstrate about Basics of Python Programming.
	b) Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
	c) Demonstrate the working of following functions in Python. i) id( ) ii) type( ) iii) range( )
	d) Write a Python program to demonstrate various base conversion functions.
	e) Write a Python program to demonstrate various type conversion functions.
2	a) Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator

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	vii) Membership Operators viii) Identity Operators
3	a) Write Python programs to demonstrate the following: i) input( ) ii) print( ) iii) 'sep' attribute iv) 'end' attribute v) replacement Operator ({ })
	b) Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if – elif – else statement
	c) Demonstrate the following Iterative statements in Python with suitable examples. i) while loop ii) for loop
	d) Demonstrate the following control transfer statements in Python with suitable examples. i) break ii) continue iii) pass
4	Write Python programs to print the following Patterns:
	i) A A B A B C A B C D A B C D E ii) * * * * * * * * * * * * * * *
	iii) E E E E E E E E E D D D D D D D C C C C C B B B A iv) 4 4 3 4 3 2 4 3 2 1 4 3 2 1 0 4 3 2 1 4 3 2 4 3 4
	v) 4 3 4 2 3 4 1 2 3 4 0 1 2 3 4 1 2 3 4 2 3 4 3 4 4 vi) * * ** ** *** *** **** **** **********
	vii) ** ** **** **** ****** ****** ******** ******** ********** ********** viii) E D E C D E B C D E A B C D E B C D E C D E D E E
5	a) Write a Python program to demonstrate various ways of accessing the string.

	i) By using Indexing (Both Positive and Negative) ii) By using Slice Operator
	b) Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()
6	a) Demonstrate the different ways of creating list objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) split( ) iii) len( ) iv) count( ) v) index ( ) vi) append( ) vii) insert( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )
	c) Demonstrate the following with suitable example programs: i) List slicing ii) List Comprehensions
7	a) Demonstrate the different ways of creating tuple objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )
8	a) Demonstrate the different ways of creating set objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on sets in Python with suitable examples: i) add( ) ii) update( ) iii) copy( ) iv) pop( ) v) remove( ) vi)discard( ) vii) clear( ) viii) union() ix) intersection( ) x) difference( )
9	a) Demonstrate the different ways of creating dictionary objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: i) dict( ) ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi)popitem( ) vii) keys( ) viii) values() ix) items( ) x) copy( ) xi) update( )
10	a) Demonstrate the following kinds of Parameters used while writing functions in Python. i) Positional Parameters ii) Default Parameters iii)Keyword Parameters iv) Variable length Parameters
	b) Write a Python program to return multiple values at a time using a return statement.
	c) Write a Python program to demonstrate Local and Global variables.
	d) Demonstrate lambda functions in Python with suitable example programs.
11	a) Python program to perform read and write operations on a file.
	b) Python program to copy the contents of a file to another file.
	c) Python program to count frequency of characters in a given file.
	d) Python program to print each line of a file in reverse order.

	e) Python program to compute the number of characters, words and lines in a file.
12	Demonstrate various Object Oriented Programming Concepts in Python Programming with illustrative examples.
13	Demonstrate about Exception Handling in Python Programming with illustrative examples.
14	a) Demonstrate the following in-built functions to use Regular Expressions very easily in our applications. i) compile( ) ii) finditer( ) iii) match( ) iv) fullmatch( ) v) search( ) vi) findall( ) vii) sub( ) viii) subn( ) ix) split( )
	b) Write a Regular Expression to represent all RGM language (Your own language) identifiers. **Rules**: 1. The allowed characters are a-z,A-Z,0-9,#. 2. The first character should be a lower case alphabet symbol from a to k. 3. The second character should be a digit divisible by 3. 4. The length of identifier should be at least 2. Write a python program to check whether the given string is RGM language identifier or not?
	c) Write a Regular Expression to represent all 10 digit mobile numbers. **Rules:** 1. Every number should contains exactly 10 digits. 2. The first digit should be 7 or 8 or 9 Write a Python Program to check whether the given number is valid mobile number or not?

TEXT BOOKS

1. Learning Python, Mark Lutz, Orielly, 3 Edition 2007.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017.

REFERENCE BOOKS

1) Think Python, 2 Edition, 2017 Allen Downey, Green Tea Press
2) Core Python Programming, 2016 W.Chun, Pearson.
3) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
4) https://www.w3schools.com/python/python_reference.asp
5) https://www.python.org/doc/

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II B.Tech, II-Sem(ECE)

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(A0495204) ARM PROGRAMMING LAB

COURSE OBJECTIVES:
This course will enable students to:
- Understand the instruction set of ARM Cortex M3, a 32 bit microcontroller and the software tool required for programming in Assembly and C language.
- Program ARM Cortex M3 using the various instructions in assembly level language for different applications.
- Interface external devices and I/O with ARM Cortex M3.
- Develop C language programs and library functions for embedded system applications.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Write programs in ARM for a specific Application.
- Interface memory and Write programs related to memory operations.
- Interface A/D and D/A convertors with ARM system.
- Analyze the performance of interrupt and Communication protocols.
- Write programs for interfacing keyboard, display, motor and sensor.

MAPPING OF COs & POs:

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

Note:
1) **The experiments to be conducted using STM32 Blue Pill development board, using Keil IDE or Arduino IDE**
2) **Minimum 12 experiments are to be conducted**

List of Experiments

1. Implementation of calculator with calculation of min, max and average.
2. Solv a equation $y = 3x^3 - 7x^2 + 10x - 11$
3. LED and Switch/ button Interfacing
4. Working with Digital I/O
   a. LCD Interfacing
   b. Keyboard Interfacing
   c. Flashing of LEDs
5. Temperature sensor Interfacing
6. Stepper Motor Interfacing
7. Working with Analog input and PWM
   a. ADC Interfacing
   b. DAC Interfacing
8. Working with UART – Serial Communication
9. Working with SPI and accessing devices/sensor based on I2C
10. Working with I2C and accessing devices/sensor based on I2C

11. Working with CAN and accessing devices/sensor based on CAN
12. Working with DHT module
13. Interrupt pooling
14. EPROM Interfacing
15. Real Time Clock Interfacing
16. Implementing Zigbee protocol with ARM.
17. Accessing a network with Ethernet module.
18. Study of one type of Real Time Operating Systems (RTOS) with ARM Processor

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(A0496204) ELECTRONIC CIRCUITS – ANALYSIS AND DESIGN LAB

COURSE OBJECTIVES:
- Help students make transition from analysis of electronic circuits to design of electronic circuits.
- To understand the Analysis of transistor at low frequencies.
- To understand the concept of designing of power amplifier.
- To understand the concept of negative feedback in amplifier circuit.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Design and draw the frequency response of small signal BJT, FET and MOSFET amplifiers.
- Draw the frequency responses of multistage amplifiers.
- Design the different types of oscillator circuits.
- Determine the efficiency of power amplifiers.
- Design and draw the frequency response of Feedback amplifiers.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2		1							1		2	1
CO2	2	2			2							2	1	2	
CO3	2	3	2	2	1							2	2	1	
CO4	1	3	2	2								1	3	1	1
CO5	3	1	2		1							2		1	1

PART-A

Note: Design & simulate any 9 experiments with Multisim / PSPICE or equivalent software and verify the results in hardware lab with discrete components.

LIST OF EXPERIMENTS:

1) Soldering practice of electronic circuits.
2) Design and implement voltage divider based Common emitter amplifier and calculate the gain and the bandwidth of the amplifier from its frequency response.
3) Design and implement common source MOSFET (Enhance mode) amplifier and calculate the gain and the bandwidth of amplifier from its frequency response.
4) Design and implement two stage RC coupled amplifier for given specifications. Determine Gain and Bandwidth from its frequency response curve.
5) Design and implement Darlington amplifier. Determine Gain and Bandwidth from its frequency response curve.
6) Design and implement CE – CB Cascode amplifier. Determine Gain and Bandwidth from its frequency response curve.
7) Design and implement voltage series feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a voltage series feedback amplifier.
8) Design and implement current shunt feedback amplifier for the given specifications. Determine the effect of feedback on the frequency response of a current shunt feedback amplifier.
9) Design and implement RC Phase shift oscillator and Wien bridge oscillator for the

given specification. Determine the frequency of oscillation.

10) Design and implement Hartley and Colpitts oscillators for the given specifications. Determine the frequency of oscillation.
11) Design and implement class A power amplifier and find out the efficiency. Plot the output waveforms.
12) Design and implement single tuned amplifier. Determine the resonant frequency and bandwidth of a tuned amplifier.

PART-B

Note: Implement the following experiments in PCB with discrete components that are designed in PART-A.

1) Common Emitter amplifier.
2) Two stage RC coupled amplifier.
3) Voltage Series feedback amplifier.
4) RC phase shift Oscillator.

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III B.Tech, I-Sem (ECE)

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(A0412205) LINEAR AND DIGITAL IC APPLICATIONS

COURSE OBJECTIVES:

- To study Op-Amps, Classification of Op-Amps.
- To study and design various linear and nonlinear applications of Op-Amps.
- To study and design Analog Filters and Converters.
- To study Timers and Phase Locked Loops.
- To study CMOS logic
- To study Combinational and sequential logic using digital ICs.

COURSE OUTCOMES:

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

- Understand the Characteristics of Op-Amps
- Analyse and design the Linear and Non-Linear Op-Amp circuits
- Analyse and design Active filters and Converters.
- Analyse and Design Multivibrators using IC555 and understand working principle of PLL
- Understand CMOS logic and Implement Combinational and Sequential Circuits.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												1	2	
CO2	1	3	3										2	2	
CO3	1	3	3										2	2	1
CO4	1	3	3										2	2	
CO5	2												1	1	2

UNIT I

INTRODUCTION TO OP-AMPS: Integrated Circuits- Classification, Package types ,Pin identification, Temperature ranges, Power supplies, OP-Amp Block diagram, Ideal and Practical OP-Amp Specifications, 741 OP-Amp and its features, Op-Amp Characteristics: DC and AC characteristics, Inverting and Non-Inverting Amplifier (Open loop and Closed loop Configurations).

UNIT II

LINEAR APPLICATIONS OF OP-AMPS: Adder, Subtractor, Integrator and Differentiator, Instrumentation amplifier, V to I and I to V converters, Buffers.

NON-LINEAR APPLICATIONS OF OP-AMPS: Comparators, Schmitt Trigger, Multivibrators, Triangular and Square wave generators, Log and Antilog amplifiers, Oscillators: RC Phase Shift Oscillator, Wien bridge oscillator.

UNIT III

ANALOG FILTERS AND CONVERTERS: Introduction, Butterworth filters-first order, second order LPF, HPF filters. Band pass, Band reject and all pass filters.

D/A AND A/D CONVERTERS: Introduction, Basic DAC techniques, weighted resistor DAC, R-2R Ladder DAC, Inverted R-2R DAC and different types of ADCs-parallel comparator type ADC, counter type ADC, successive approximation ADC and Dual slope ADC.DAC and ADC specifications.

UNIT IV

TIMERS AND PHASE LOCKED LOOPS: Introduction to 555 Timer, functional diagram,

Monostable and Astable operations and applications, Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks, Introduction to IC 566, VCO applications and details.
Voltage Regulators: Three terminal voltage regulators, IC 723 voltage regulators.

UNIT–V

CMOS LOGIC: CMOS Logic Levels, Basic CMOS inverter, AND, OR, NAND and NOR Gates, CMOS AND-OR-INVERTER and OR-AND-INVERTER gates, Implementation of any function using CMOS logic.

UNIT-VI

COMBINATIONAL CIRCUITS USING TTL 74XX ICS: Study of logic gates using 74XX ICs, 4-bit parallel adder (IC7483), Comparator (IC 7485), Decoder (IC74138), Encoder (IC74148), Multiplexer (IC 74151), Demultiplexer (IC 74154).
SEQUENTIAL CIRCUITS USING TTL 74XX ICs: Flip Flops(IC 7474, IC 7473), Shift Registers (IC 74x164, IC 74x166), Universal Shift Registers(IC 74194), 4-bit synchronous binary counter(IC 74X163, 74X160).

TEXT BOOKS:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, Revised 4th edition, 2021.
2. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 5th Edition, 2018.
3. Digital design – John F.Wakerly, Pearson Education India, 5th Edition, 2008.

REFERENCES:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 3rd ed., 2012.
2. Operational Amplifiers & Linear ICs by David A. Bell, 3rd ed., Oxford University Press, 2011.
3. Integrated circuits by K.R.Botkar, Khanna Publishers, 2013.

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III B.Tech, I-Sem (ECE)

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(A0413205) ANALOG COMMUNICATION

COURSE OBJECTIVES:

- To study the fundamental concept of the communication systems.
- To study various analog modulation techniques.
- To study various transmitters and receivers.
- To study the influence of noise in communication systems.

COURSE OUTCOMES:

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

- Acquire the basic knowledge of various Continuous Wave and pulse Modulation techniques and distinguish between these systems.
- Comprehend the basics of Communication System and Analog Modulation Methods.
- Apply the basic knowledge of signals and systems and basic mathematics while analysing the modulation systems mathematically.
- Choose and design appropriate type of transmitter and receiver for the given area of communication system.
- Recognize and purge the effects of noise on different modulation systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3													2	
CO2	2	3	1										1		
CO3	3	3	2											2	1
CO4		3	3	2									2		
CO5	2	2	3	2											3

UNIT I

INTRODUCTION TO COMMUNICATION SYSTEMS: Communication process, Elements of Communication Systems; Types of communication systems, its frequency ranges, Modulation: Need for Modulation, Types of modulation: AM, FM, PM, Advantages, Disadvantages and Applications.

UNIT II

LINEAR CW MODULATION: Introduction, Mathematical Representation of AM, single tone modulation index and multi tone modulation index, Power Relationships, AM signal generation (Square law, switching modulation), demodulation (Envelop detector), Virtues and Limitations of AM.

DSB-SC: Mathematical Representation of DSB-SC, DSB-SC generation (Ring modulation), Demodulation: Coherent detection, filtering of AM Signals and Spectra, DSB signals and spectra.

SSB-SC: Filtering of sidebands, SSB signal generation and demodulation using Hilbert transform, VSB Generation and demodulation, illustrative problems.

UNIT III

ANGLE CW MODULATION: Introduction, Types of Frequency Modulation (FM), Mathematical representation of FM, Modulation index, Deviation sensitivity, Deviation ratio, Transmission bandwidth of FM (Carson's rule), Narrow band FM, Wide band FM, generation of FM: Direct Method, Indirect Method, demodulation of FM. Voltage and Power for FM, Pre-emphasis and De-emphasis, Illustrative Problems.

Phase modulation and indirect FM; FM demodulators: Slope detector, Balanced slope discriminators, Phase difference discriminators, Ratio detector, PLL Detector.

UNIT IV

TRANSMITTERS AND RECEIVERS: AM TRANSMITTERS: Low level and high level transmitters, FM TRANSMITTERS: Armstrong FM transmitters, RECEIVERS: TRF receivers, super heterodyne receiver.

UNIT V

PULSE MODULATION TECHNIQUES: Definition, Types: PAM, PWM, PPM, Sampling, Nyquist rate, Different sampling techniques, Generation and Detection of PAM, PWM, PPM.

UNIT VI

NOISE IN COMMUNICATION SYSTEMS: Introduction, Noise in Base band Systems, Noise figure, different types of noise, System Model and Parameter, SNR at the output of a Base band System. Noise in AM systems: System model and parameter, Noise in DSB and SSB Systems. Noise in Angle Modulation Systems: Output SNR in Angle Modulation, Threshold effects in Angle Modulation Systems. Improvement of SNR using Pre-emphasis and De-emphasis.

TEXT BOOKS:

1. Simon Haykin, "Communication Systems", Wiley-India edition, 5thedition, 2010.
2. B.P. Lathi, ZhiDing & Hari Mohan Gupta, "Modern Digital & Analog Communication Systems", Oxford University Press, 4th edition, 2017.

REFERENCES:

1. A.Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2012.
2. Electronic Communication Systems by George Kennedy, Bernard Davis, S. R. M Prasanna, McGraw Hill Education, 6th edition 2017.
3. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 5th Edition, 2018.
4. Digital and Analog Communication Systems, Sham Shanmugam, Wiley, 1st edition, 2019.
5. "Electronic Communications systems" Modulation and Transmission-Robert Schoenbeck, Prentice Hall India Learning Private Limited, 2nd edition, 1998.

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III B.Tech, I-Sem (ECE) | L | T | C
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(A0414205) ANTENNAS AND WAVE PROPAGATION

COURSE OBJECTIVES:

- To make the students to be aware of fundamentals of antenna theory and its basic parameters.
- To make them learn the fundamental principles of transmission line theory related to communications including the propagation of signals on a transmission line and in free space
- To make them to understand how a radio wave propagates through various layers of atmosphere and against its climatic changes.

COURSE OUTCOMES:

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

- Examine the characteristics and comprehend various parameters of a given antenna by applying the Vector Calculus for Radiation (Pattern) Measurement.
- Design various antennas: from simple single-wire antenna to complex antenna arrays and to evaluate their parameters.
- Characterize different types of antennas depending on the application.
- Assess the need for Antenna Arrays and analyse different Antenna Arrays mathematically.
- Outline the factors involved in the Propagation of Radio Waves and decide which Mode of Wave Propagation

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2												1	
CO2		2	3	1				1	1						2
CO3		3	2		1		2					1	1	2	
CO4	2	2	3	1										2	
CO5		3	2									1		1	

UNIT I

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, Two-wire, Current Distribution on a Thin wire Antenna of different lengths. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam Width, Beam Area, Radiation Intensity, Radiation Resistance, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height. Near-field and Far-field regions.

UNIT II

BASIC ANTENNA ELEMENTS: Retarded Potentials (Vector and Scalar Descriptions), Hertzian Dipole, Half-wave Dipole, Quarter-wave Monopole; Current Distribution, Evaluation of Field Components, Expression for Radiated Power and antenna parameters for Alternating Current-Carrying Element, Half-wave Dipole and Quarter-wave Monopole; Small Loop Antenna, Comparison between Loop Antenna and Dipole, Illustrative problems.

UNIT III

ANTENNA ARRAYS: Introduction to Antenna Arrays, Purpose of Antenna Arrays; N-element Uniform Linear Arrays – Broadside Arrays (BSA), End-Fire Arrays (EFA), Collinear Arrays, Parasitic Arrays, Derivation of their Characteristics of BSA and EFA with Increased

Directivity, Comparison of BSA and EFA. Principle of Pattern Multiplication, Binomial Arrays; Effects of Uniform and Non-Uniform Amplitude Distributions, Related Problems.

UNIT IV

HF, VHF AND UHF ANTENNAS: Classification of Antennas based on different characteristics. HF, VHF Antennas: V-antennas, Rhombic Antennas and Design Relations, Helical Antennas– Significance, Geometry, Basic properties; Design considerations, Modes of Helical antennas- Axial Mode and Normal Mode. Yagi - Uda Antenna Arrays, Folded Dipoles & their characteristics. Reflector Antennas: Flat Sheet and Corner Reflectors; Paraboloidal Reflectors– Geometry, Characteristics, Types of Feeds. Cass grain feed system.

UNIT V

MICRO-WAVE FREQUENCY and mm WAVE ANTENNAS: Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns, Babinet's Principle; Lens Antennas – Geometry, Features, Types- Non-metallic & Metallic lens and Zoning, Patch and Slot Antennas; Applications of all antennas. Microstrip antennas: Geometry, Features, applications; mm Wave Antennas: In-Package antennas for mm waves, Emerging Applications of mm wave antennas;

Antenna Measurements - Introduction, Co-Ordinate System, Patterns to be measured, Pattern Measurement Arrangement, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT VI

WAVE PROPAGATION: Introduction-Frequency ranges and modes of propagations. Ground Wave Propagation– Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations and Roughness Calculations.

SKY WAVE PROPAGATION– Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF & Skip Distance – Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption. SPACE WAVE PROPAGATION - Introduction, field strength variation with distance and height, effect of Earth's Curvature, M-curves and Duct propagation, scattering phenomena, fading path loss calculations.

TEXT BOOKS

1. Antennas and Wave Propagation - GSN Raju, Pearson Education India, 1st ed., 2009.
2. Antenna Theory - C.A. Balanis, John Wiley & Sons, 2nd ed., 2001.
3. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 3rd ed., Reprint 2003.

REFERENCE

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, Pearson Education India, 2nd Edition, 2015.
2. Antennas and Wave Propagation- John D. Krauss and Ronald J. Marhefka and Ahmad S. Khan, McGraw Hill, 5th Edition, 2017.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Antennas and Wave Propagation by V.Soundararajan & Salai ThillaiJhilagam.J., Scitech Publications India Pvt. Ltd., 3rd ed., 2013.
5. Millimeter Wave Wireless Communications, Robert W. Heath, Robert C. Daniel, James N. Theodore S. Rappaport, Murdock, Prentice Hall, 2014.

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(A0218205) CONTROL SYSTEMS ENGINEERING
(Professional Elective-I)

COURSE OBJECTIVES
- Be prepared to apply mathematics, established scientific and engineering knowledge, for the development and implementation of a broad range of electronic systems
- Be knowledgeable about current technologies and be prepared to adapt to technology advances and ensure professional growth through an appreciation for lifelong learning.
- Basic skill in methods of design and analysis across a broad range of electrical and computer engineering areas

COURSE OUTCOMES
At the end of the course, the student will be able to:
- Obtain the transfer function of the LTI systems.
- Analyse the system behaviour for different test signals using time domain specifications.
- Determine the stability of the LTI system
- Understand and draw the Bode plot, Polar plot and Nyquist plot
- Usage of state space analysis.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											3	2	1
CO2	2	3											3	2	1
CO3		2		2									2	2	2
CO4			1	3									2	3	1
CO5	1		2										2	1	2

UNIT-I
INTRODUCTION: Concepts of control systems – Open loop and closed loop control systems and their differences, examples, Mathematical modeling of Electrical & Mechanical (translational & rotational) systems, differential equations- Electrical analogous (F-V,F-I) of mechanical system- use of Laplace transforms in control systems-Transfer function: concepts, features-Transfer functions of above systems

UNIT-II
BLOCK DIAGRAM REDUCTION & SIGNAL FLOW GRAPH REPRESENTATION: Block diagram representation of electrical systems and reduction techniques - Signal flow graphs and reduction using mason's gain formula- Transfer function of DC servomotor, AC servomotor

UNIT-III
TIME RESPONSE ANALYSIS: Definition & classification of time response- Standard test signals – Type & order of a system- Transient response of fist order and 2^{nd} order systems for step input- Transient response specifications (Definitions only)- Steady state response- Steady sate errors and error constants- Effects of PD, PI & PID controllers.

UNIT- IV
STABILITY ANALYSIS IN S-DOMAIN: The concept of stability - Routh stability criterion, special cases, advantages and limitations

Root locus technique: The root locus concept, construction of root loci- Effects of adding poles and zero's to G(s) H(s) on the root loci.

UNIT- V

FREQUENCY RESPONSE ANALYSIS: Introduction – Steady state response to sinusoidal input (frequency response) - Bode diagrams- Phase margin and gain margin- Stability analysis from Bode plots- Determination of transfer function from Bode diagram- Polar plots - Nyquist plots- Stability analysis

UNIT – VI

STATE SPACE ANALYSIS: Concept of state, state variables and state model, derivation of state models from block diagrams- solving time invariant state equations –state transition matrix and its properties.

TEXT BOOKS:

1) Control System Engineering – I.J. Nagarath and M.Gopal, New age international (P) limited, 2nd edition.

REFERENCE BOOKS:

1) Modern control engineering – Katsuhiko Ogata, PHI, 3rd edition1998
2) Control Systems Engineering- NISE, 3rd Edition-John Wiley
3) Automatic control systems – B.C. Kuo, Jhon wiley and son's 2003

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III B.Tech, I-Sem (ECE)

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(A0416205) SENSORS AND SIGNAL CONDITIONING
(Professional Elective-I)

COURSE OBJECTIVES:
- Understanding various input interfacing techniques for different kind of sensors like resistive, capacitive, inductive etc.
- Leaning non-idealities of amplifiers, improvement, reduction of noise, improvement of system performance etc.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Able to carry out research and development in the area of advanced instrumentation and signal conditioning.
- To be well versed with the sensor characteristics, basic signal conditioning circuits and sensor interfaces.
- Able to analyze and design different kinds of signal amplifiers, their non-idealities, and performances.
- Able to analyze and design noise and interference reduction circuits and improve the system performance.
- Solve practical and state of the art problems related to sensor interfacing circuits and serve the related industries.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	1	-	-	-	-		-	2	-	1
CO2	2	1	-	-	-	-	-	-	-	-	-	-	2	-	2
CO3	2	2	1	1	1	-	-	-	1	-	-	-	2	1	2
CO4	2	-	-	-	1	-	2	-	-	-	-	-	2	-	1
CO5	1	-	1	-	1	-	-	-	-	-	-	-	1	1	1

UNIT I
INTRODUCTION TO SENSOR-BASED MEASUREMENT SYSTEMS: General concepts and terminology **-** Sensor classification- Static characteristics of measurement systems**:** accuracy, precision, sensitivity, linearity, threshold, resolution**-**Systematic errors-Random errors-Dynamic characteristics of measurement systems: zero-order, first-order, and second-order measurement systems and response to step, ramp and sinusoidal inputs.

UNIT II
RESISTIVE SENSORS: Potentiometers - Strain gages and types - Resistive temperature detectors (RTDs), - Thermistors - Magneto resistors - Light-dependent resistors (LDRs).

UNIT III
SIGNAL CONDITIONING FOR RESISTIVE SENSORS: Measurement of resistance - Voltage dividers - Wheatstone bridge: Balance and deflection measurements - Sensor bridge calibration, balance and compensation - Instrumentation amplifiers.

UNIT IV
REACTANCE VARIATION AND ELECTROMAGNETIC SENSORS: Capacitive sensors**:** variable & differential - Inductive sensors**:** Variable reluctance and eddy current sensors, LVDTs, Variable transformers (synchros and resolvers), Magneto elastic and magneto

strictive sensors - Electromagnetic sensors: Sensors based on faraday's law, Hall Effect sensors.

UNIT V

SIGNAL CONDITIONING FOR REACTANCE VARIATION SENSORS: Problems and alternatives**-** AC bridges- Carrier amplifiers, Detection & application to LVDTs

UNIT VI

SELF-GENERATING SENSORS: Thermoelectric sensors**:** Thermocouples, Piezoelectric and Pyroelectric sensors- Photovoltaic sensors- Electrochemical sensors.

SIGNAL CONDITIONING FOR SELF-GENERATING SENSORS: Offset and drifts in OP amps-Chopper and Auto zero amplifiers- Electrometer- Transimpedance amplifiers-Charge amplifiers- Noise in amplifiers.

TEXT BOOK:

1) Sensors and Signal Conditioning: Ramon Pallás Areny, John G. Webster, 2nd edition, John Wiley and Sons, 2000.

REFERENCES:

1) Sensor Technology Hand Book-Jon Wilson ,Newne 2004
2) Instrument Transducers – An Introduction to Their Performance and Design – by Herman K.P. Neubrat, Oxford University Press.
3) Measurement System: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
4) Instrumentation Devices and Systems – by C.S.Rangan ,G.R.Sarma,V.S.V.Mani Tata McGraw Hill Publications.
5) A Course in Electrical and Electronic Measurements and Instrumentation –by A.K.Sawhney, Puneet Sawhney Dhanpat Rai & Co (P) Ltd.
6) Industrial instrumentation, principles and design- by Tattamanglam R. Padmanabhan-springer india-2005.

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(A0215205) NEURAL NETWORKS & FUZZY SYSTEMS

(Professional Elective-I)

For branches: EEE & ECE

COURSE OBJECTIVES:

- To introduce the basics of Artificial Neural Networks
- To introduce the different learning strategies
- To introduce the different supervised learning networks Associative Memories
- To introduce the basics of classical and fuzzy sets
- To introduce the concepts of fuzzy logic system components

COURSE OUTCOMES:

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

- Differentiate artificial neural networks from biological neural networks
- Know the different learning strategies
- Know the concepts of single layer and multilayer neural networks and their learning algorithms
- Understand the concepts of Associative memories
- Know the concepts of classical and fuzzy sets
- Understand the concepts of fuzzy logic system components

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-	1	1	-	-
CO4	3	3	3	2	3	-	2	-	-	-	-	2	1	-	-
CO5	3	3	3	2	1	-	-	-	-	-	-	-	1	-	-
CO6	3	3	3	3	2	-	-	-	-	-	-	2	1	-	-

UNIT I

ARTIFICIAL NEURAL NETWORKS: Introduction, Biological Neuron, Artificial Neuron, Basic concepts of Neural Networks, Basic Models of ANN Connections, McCulloch-Pitts Model, Characteristics of ANN, Applications of ANN.

UNIT II

ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS: Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategies (Supervised, Unsupervised, Reinforcement), Learning Rules, Numerical problems, Types of Application

UNIT III

SUPERVISED LEARNING NETWORKS: Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Radial Basis Function Demonstration through MATLAB

UNIT IV

ASSOCIATIVE MEMORY NETWORK: Training Algorithms for Pattern Association, Auto Associative Memory Network, Hetero Associative Memory Network, BAM, Hopfield Networks, Applications

UNIT V

CLASSICAL & FUZZY SETS: Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT VI

FUZZY LOGIC SYSTEM COMPONENTS: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods, Applications

TEXT BOOKS:

1. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publications.
3. Fundamental of Artificial Neural Network and Fuzzy Logic-by Rajesh Kumar, Lakshmi publications

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education.
2. Neural Networks – Simon Hakins , Pearson Education

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(A0417205) BIO-MEDICAL INSTRUMENTATION

(Professional Elective-I)

COURSE OBJECTIVES:

- To discuss the basics of biomedical instrumentation system and bioelectrodes
- To explain the concepts of Cardiac, neuro and respiratory instrumentation
- To explain the medical imaging principles

COURSE OUTCOMES:

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

- Analyse the problems encountered in human body and their measurement by using various Instruments.
- Differentiate the different types of Electrodes suitable for measurement of different parameters of human body.
- Can able to analyse the functioning of Heart, eventually able to determine the characteristics of P, Q, R, S, T ECG waveform.
- Analyse the working of different types of Pacemakers, Defibrillators etc.,
- Get to know about the Neuronal Communication system, Brain working and Measurement of EMG and EEG by Electrodes.
- Get to know the functioning of Spirometers Body Plethysmograph Respiratory Therapy Equipment: Inhalators, Ventilators/Respirators

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	2		1							1	2		
CO2	2	2			2							2		2	
CO3	2	3	2	2	1							2	1		
CO4	1	3	2	2								1	2		
CO5	3	1	2		1							2			1
CO6	3	2	2		2							3		2	

UNIT I

INTRODUCTION: Components of Medical Instrumentation System Problems, encountered with measurements from human beings levels of structural organization of the human body Physiological systems of the body Organization of cell Resting membrane potential Generation of Action Potential and conduction through nerve cell.

UNIT II

BIO ELECTRODES: Electrode theory Electrode characteristics Bio potential Electrodes**:** micro, skin surface and needle electrodes Biochemical electrodes**:** reference electrodes, ph electrode, blood gas electrodes.

UNIT III

CARDIAC INSTRUMENTATION-I: Cardiovascular system Electrical Conduction system of the heart Cardiac cycle The ECG**:** Einthoven triangle, Standard 12lead configurations Interpretation of ECG waveforms with respect to electromechanical activity of the heart ECG recorder principles.

UNIT IV

CARDIAC INSTRUMENTATION-II: Blood flow measurements, Blood pressure measurements, Pace maker, Defibrillators Hemo dialysis.

UNIT V

NEURO MUSCULAR INSTRUMENTATION: Nervous System**:** Anatomy, Structure, Functions, Organization Neuronal communication Brain**:** Anatomy, Organization, EEG: Electrode Placement, Recorder Principles, Interpretation of waveforms, Neuromuscular junction and EMG.

UNIT VI

RESPIRATORY INSTRUMENTATION: The Physiology of the Respiratory system lung volumes and capacities Spirometers Body Plethysmograph Respiratory Therapy Equipment: Inhalators, Ventilators/Respirators, Humidifiers, Nebulizers, Aspirators.

TEXT BOOKS:

1. Biomedical Instrumentation and Measurements – by Leslie Cromwell, F.J.Weibell, E.A. Pfeiffer, PHI.

REFERENCES:

1. Human Physiology: from cells to system- by Lauralee Sherwood, 6th edition, Thomson Brooks/Cole.
2. Medical Instrumentation, Application and Design - by John G. Webster, John Wiley.
3. Principles of Applied Biomedical Instrumentation - by L.A. Geoddes and L.E.Baker, John Wiley and Sons.
4. Introduction to Biomedical Equipment Technology - by Joseph J Carr, John M.Brown, 4th Edition Pearson Education.

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(A0515205) ARTIFICIAL INTELLIGENCE
(Open Elective-I)
For branches: ECE, CSE & CSE&BS

COURSE OBJECTIVES:
This course is designed to:
- Learn different AI techniques and their implementation.
- Understand types of agents and the activities of agents.
- Learn problem solving using searching techniques, Problem characteristics and their implementations.
- Apply knowledge representation using pre-positional logic and First Order logic.
- Understand various learning algorithms

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand and Learn Foundations of Artificial Intelligence.
- Learn Formulation of Problems as Search Problem and How to Solve Problems using Search Strategies.
- Represent Knowledge using Logic, interpret world-using process of inference, develop programs that extract Knowledge.
- Handle Uncertainty using Probability Notations.
- Know the Learning Agents: Inductive Learning, Learning Decision Trees, Neural Network Learning
- Applying Probabilistic Language Processing Interface for Machines.

MAPPING OF COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1	2	1	1			1		2	1	1	1	2
CO2	2	3	3	2	2	1		1	1		2	1	1	1	2
CO3	3	3	3	2	2	2			1		2	2	1	2	2
CO4	2	3	1	2	2	3			1		1	2	1	2	2
CO5	2	2	3	1	2	1		1	1		1	2	1	2	2
CO6	2	3	2	3	2	1		1	2	2	2	2	1	2	2

*** 3: Strong 2: Medium 1: Week 0- NA**

UNIT I:
Introduction to AI: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, The Concept of Rationality, The Nature of Environments: PEAS, properties of Task Environment, The Structure of Agents: 4 Types of Agents

UNIT II:
Solving Problems by Searching: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Search Strategies, Heuristic Functions, Local & Heuristic Search Algorithms and Optimization Problems: Hill Climbing search, Simulated Annealing, Genetic Algorithms. Constraint Satisfaction Problems.

UNIT III:
Knowledge Reasoning and Inference: Knowledge based Agent, The Wumpus World Problem, **Logic**: Propositional Logic, First-Order Logic Knowledge and Reasoning: Inference

in First-Order Logic: Propositional vs First Order inference. First-Order Logic: Syntax and Semantics of First order Logic, Using First Order Logic, Unification and Lifting, Forward Chaining. **Planning**: The planning problem formulation, The Language of Planning Problems, Examples: Air Cargo Transport, Spare Tyres.

UNIT IV:

Uncertainty Handling: Acting under Uncertainty, Basic Probability Notation, Axioms of Probability, Inference using Full Joint Distribution, Bayes Rule and its Use, Probabilistic Reasoning Representing Knowledge in an Uncertain Domain, The semantics of Bayesian Networks.

UNIT V:

Learning: Forms of Learning, Inductive Learning, Learning Decision Trees, Ensembled Learning, Computational Learning.

Statistical Learning: Instance Based Learning, Nearest neighbor Models,

Neural Networks: Units in Neural Networks, Neural Network Structures, Single Layer Feed Forward Networks, Multilayer Feed Forward Neural Networks. Learning Neural Network structures.

UNIT VI:

Language Processing and **Present and Future of AI:**

Probabilistic Language Processing: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Information Retrival, Information Extraction, Machine Translation.

Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI.

AI Present and Future: Agent Components**,** Agent Architectures, Are we going in the right direction, What if AI does succeed.

TEXTBOOK:

1. Stuart J.Russell, Peter Norvig, “Artificial Intelligence A Modern Approach”, 3rd Ed, Pearson Education/ Prentice Hall 2019.

REFERENCES:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.

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(A0026205) MATHEMATICAL METHODS
(Open Elective-I)

COURSE OBJECTIVES:
- To familiarize the concepts of numerical methods and their applications in engineering.
- To equip the students to solve various application problems in engineering through evaluation of linear programming.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand the use of various numerical methods in solving Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Apply the concept of numerical differentiation in digital signal processing, discrete Fourier transform, digital filters and Oscillatory theory in engineering.
- Analyze numerical differentiation and integration to solve various engineering problems.
- Determine the process of curve fitting to approximate various numerical data.
- Identify the applications of linear programming and transportation problems in telecommunication engineering.

MAPPING OF COs & POs:

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

UNIT I
Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton - Raphson Method.
Interpolation: Introduction – Finite differences – Forward Differences – backward Differences –Newton's forward and backward difference formulae for interpolation – Lagrange's Interpolation formula.

UNIT II
Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.
Curve fitting: Fitting a straight line – Second degree curve – Exponential curve-Power curve by method of least squares.

UNIT III
Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Method– Milne's Predictor-Corrector Method.

UNIT IV
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one-dimensional wave equation, heat equation and two-dimensional Laplace equation under initial and boundary conditions.

UNIT V

Linear programming problems (LPP): Linear programming problems (LPP) - Graphical method-Simplex method - Big M Method - Dual simplex method.

Unit VI

Transportation & Assignment: Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. Assignment Problem: Formulation, unbalanced assignment problem, Travelling salesman problem.

TEXT BOOKS:

1. Advanced Engineering Mathematics By Erwin Kreyszig.
2. Advanced Engineering Mathematics By R.K. Jain and S.R.K. Iyengar, Narosa Publications.
3. Operations Research, S.D. Sharma.

REFERENCES:

1. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and Others S. Chand & Company.
2. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
3. A Text Book of Engineering Mathematics, Thomson Book Collection.
4. Engineering Mathematics By Srimantha Pal et.al. Oxford University Press.
5. Engineering Mathematics, Sarveswara Rao Koneru, Universities Press.

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(A0418205) VIRTUAL INSTRUMENTATION
(Open Elective-I)

COURSE OBJECTIVES:
- To understand what is Virtual instrumentation and to realize the architecture of VI.
- To familiarize with the VI software and learn programming in VI.
- To study various Instrument Interfacing and data acquisition methods.
- To understand various analysis tools and develop programs for Process control applications.
- To study a few applications in virtual instrumentation.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand the basics of virtual instrumentation and its Architecture.
- Familiarize with VI software (Labview) and learn programming
- Familiarize with various interfacing and data Acquisition methods
- Understand various analysis tools in Virtual Instrumentation
- Develop programs for process control applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			1	1							1		
CO2	2	2	2		1	1								2	
CO3	1		3	2						1		1	1		1
CO4	2	1	1		1					1		1	2	1	
CO5	1	3		2	2	1				1		1		1	2

Course Aim: This course aims to introduce the latest instrumentation system design and development tools available today.
Prerequisite: Course on Personal Computer Systems and Interfacing.

UNIT I
VIRTUAL INSTRUMENTATION: An introduction Historical perspective, advantages, block diagram and architecture of a virtual instrument, dataflow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Realtime systems.

UNIT II
VI PROGRAMMING TECHNIQUES: VIs and subVIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

UNIT III
DATA ACQUISITION BASICS: Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

UNIT –IV
VI INTERFACE REQUIREMENTS: Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. **Bus Interfaces**: USB, PCMCIA, VXI, SCSI, PCI, PXI, Fire wire. PXI

system controllers, Ethernet control of PXI. Networking basics for office & Industrial applications, VISA and IVI.

UNIT V

VI TOOLSETS, DISTRIBUTED I/O MODULES: Application of Virtual Instrumentation: Instrument Control, Development of process database management system.

UNIT –VI

SIMULATION OF SYSTEMS USING VI: Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

TEXT BOOKS:

1. LabVIEW Graphical Programming, Gary Johnson, Second edition, McGraw Hill, Newyork, 1997.
2. LabVIEW based Advanced Instrumentation Systems, S. Sumathi and P. Surekha, Spinger.
3. Virtual Instrumentation Using LabVIEW, Sanjay Gupta & Joseph John, TMH, New Delhi.

REFERENCES:

1. PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Kevin James, Newnes, 2000.
2. WEB RESOURCES: www.ni.com.
3. LabVIEW for everyone, Lisa K. wells & Jeffrey Travis Prentice Hall, New Jersey, 1997.

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(A3401203) BUSINESS ENVIRONMENT
(Open Elective-I)
For branches: ECE & CSE&BS

COURSE OBJECTIVES:
- To understand the dynamics of business world and its environment
- To develop an understanding of the economic environment affecting business.
- To learn about the changing dimensions of laws and impact on business.
- To study about the impact of technology and cultural aspects and LPG on Indian industry
- To study the role of the Indian Financial system in business

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Practically visualize the factors relevant to business and economy
- Know the significance of the policies which govern the business environment in the country
- Understand the impact of the changing dimensions of laws on political and legal environment of business
- Analyze how LPG has brought drastic transformation in Indian business
- Understand why the financial system is an important part in operating any business.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1			2	2				2		1	2	1
CO2	2					2	2	1				2	2	1	2
CO3				2	2	2	3	1				2	1	2	
CO4		2	3	2	1	2	2						1	2	2
C05	1	3	1	1	2			2		2		2		2	

UNIT I
Introduction: Dynamics of business & its environment, Concept of business cycle, Significance, India as an emerging and mixed economy, Economic planning in India.

UNIT II
Economic Environment: Industrial policy in recent years – Fiscal policy – Monetary policy, Economic Reforms in India - Overview of Indian International trade - Bilateral and Multilateral trade agreements – Trade Blocks

UNIT III
Political & Legal environment of Business: Critical elements of political environment – Government & Business – Changing dimensions of laws and impact on business – GST-Implications and Impediments - MRTP & FEMA and Licensing Policy, Competition Act

UNIT IV
Technological and Socio-Cultural Environment: Impact of Technology on organizations, Process of Technology adoption and development, Patents, Technology assessment at government level, ISO standards and Bureau of Indian Standards, Cross Cultural environment, social responsibility with respect to Indian Business.

UNIT V
Liberalization in India: Liberalization, Privatization and Globalization (LPG), EXIM policy

and role of EXIM Bank, FDI policy, Role of WTO in promoting world trade – Agreements reached in the Uruguay round including TRIPS, TRIMS and GATS, Disputes Settlement Mechanism - Dumping and Anti-dumping measures, Special Economic zones, Technology parks

UNIT VI

Capital Markets: Features and components of Indian Financial system, Objectives, Features and structure of Capital market and Money market, Recent developments - Stock Exchanges, Investor Protection and Role of SEBI - Legal Framework**:** Consumer Protection Act, 1986, BIFR

REFERENCES:

1. Indian Economy, Dutt and Sundaram, S. Chand, New Delhi, 2009.
2. Essentials of Business Environment, K.Aswathappa, Himalaya, 2008.
3. Business Environment – Text and Cases, Justin Paul, TMH, 2009.
4. Business Environment: Text & Cases, Francis Cherunilam, Himalaya Publishing, Latest edition.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III B.Tech, I-Sem (ECE)

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(A0419205) ARDUINO & MSP 430 PROGRAMMING

(Skill Development Course)

COURSE OBJECTIVES:

- To understand the basic concepts of embedded system using various micro controllers and its architectures.
- To Learn the Arduino programming language and IDE.
- To learn how to prototype circuits with Arduino UNO.
- To learn how to Program the Arduino board to make the circuits work for any given application.

COURSE OUTCOMES:

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

- Understand the concepts of various micro controllers used in embedded systems.
- Understand basics of Arduino & MSP 430 programming and various types of functions libraries.
- Understand how to interface Arduino & MSP 430 to various sensors and actuators.
- Gain Knowledge of interfacing various sensors and actuators.
- Integrate hardware and software for embedded system for any given application

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		1									1	3		1
CO2												1			
CO3		1	2	1	1							2	1	2	2
CO4			3												
CO5		2	3	1	1							2	3	3	2

UNIT I

Embedded System design: Basics, Introduction to embedded systems, Components of embedded system, Advantages and applications of embedded systems, Examples of real time embedded systems.

Learning Arduino Platform: Arduino Overview, Introduction to Arduino, Arduino History and Family, Features, Board Types, Arduino Uno board Description, input vs output, Arduino Program Structure, Data Types, Variables & Constants, Operators, Control Statements , Loops, Functions, Strings , Time, Arrays, **Arduino Function Libraries**

UNIT II

Learning Arduino Platform: Blinking Led, Fading Led, Switches, Push Buttons, Reading Analog voltage, Relays (AC Appliance Control), PWM Generation: DC motor, Stepper Motor, servo.

UNIT III

Working with Displays: Led Bar Graph, Seven Segment Display, Multi Segment Displays, I2C display, LCD.

Working with Sound and Sensors: Piezo Buzzer, Audio SOS Signal, Arduino Piano Keyboard, LM393 Digital Sound Sensor

UNIT IV

The basic sensors and actuators using Arduino: Introduction to sensors and actuators; How to connect and work with different sensors, such as IR Sensor, Ultrasonic Sensor, Humidity,

PIR Sensor, Water Detector Sensor, Accelerometer, Sound, Light Distance, Pressure etc., to ARDUINO Board, Reading various sensor data on serial monitor and LCD Display. Home Automation, Robot Control etc.

UNIT V

RISC – MSP 430: Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, addressing modes, Instruction set, Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

UNIT VI

I/O ports pull up/down resistors concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.
Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430

BOOKS/REFERENCE:

1) Arduino Made Simple by Ashwin Pajankar
2) Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.
3) Arduino Cookbook by Michael Margolis, O'Reilly Media, Inc., 1st edition.
4) John H. Davies, MSP430 microcontroller basics, 1st Ed., Newnes, Elsivier, 2008.
5) CemUnsalan, H. Deniz Gurhan, Programmable Microcontrollers with Applications: MSP430 LaunchPad with CCS and Grace, 1st Ed., McGraw Hill India, New Delhi, 2018.
6) https: //www.arduino.cc/en/Tutorial/HomePage
7) Arduino for beginners: Essential Skills Every Maker Needs, John Baichtal, Person Education, Inc.
8) MSP430™ MCUs Development Guide Book, Texas Instruments

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III B.Tech, I-Sem (ECE)

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(A0014203) INDIAN HERITAGE & CULTURE

(Mandatory Learning course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

INTRODUCTION

Indian Heritage is an ancient facet pertaining to bygone ages. It reflects strong ethical culture and embodiment of nature in life style. It had its deep roots in great Indian epics and Upanishads. It has been transformed and strengthened by many kings and queens. It is revived by erudite writers. The glory of Indian Heritage & culture have been ignored or distorted in wake of western culture. The present generation ought to know their indigenous culture and heritage and apply the wisdom to the current core working aspects.

COURSE OBJECTIVES

- To enable the students to have an insight into and understanding of the great heritage and culture of India.
- To sensitize them towards preservation and progression of the composite culture of India
- To make students learn soft skills and life skills from ancient treatise
- Relevance of architecture & ancient principle to the current engineering scenario

COURSE OUTCOMES

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

- Equip learners with knowledge of the heritage and culture of India.
- Acquire Leadership & Soft skills from great leaders of India
- Apply the ancient wisdom to become successful professionals
- To make them understand diversity of culture and national integrity

UNIT-I: Origin of Indian Culture& Heritage–Indus valley Civilization-Time line of Indian empires - Cultural &social conditions of India under Mauryas, Guptas & the Sathavahanas

UNIT-II: Influence of Islam on Indian Culture- Leadership skills from Akbar the Great &Krishnadeva Raya- World Heritage Sites in India

UNIT-III: Great Indian Epics–Life skills from Ramayana and Mahabharata–Ethics from Upanishads&-Vedas – Pathanjali Yoga-Principles of Jainism, Buddhism & Sufism

UNIT-IV: Indian Art Forms–Literature - Rabindranath Tagore-RK.Narayan-Sri Sri-Jashuva–Music - Saint Tyagaraja, Annamayya -Purandhara Das - Kabir Das- Dance Forms of India

UNIT-V: Social awakening and Social reform movements -Theosophical Society - Emancipation of Women in pre-independent era

UNIT-VI: Great leaders of Freedom struggle -Mahatma Gandhi- Non-violence and Satyagraha-–Subhash Chandra Bose – Bhagath Singh –Moulana Abul Kalam Azad – B.R.Ambedkar - Post Independent Era.

TEXT BOOK

1) Madanlal Malpani & Shamsunder Malpani (2009), Indian Heritage and Culture, New Delhi: Kalyani Publishers.

REFERENCE BOOKS

1) Romila Thapar (2018), Indian Cultures as Heritage: Contemporary Pasts, India.
2) AnuragMathur (2017), Indian Culture & Heritage, Create space independent publishing Platform,2017.
3) P.R.Rao& P. Raghavendra, Indian Heritage and culture, Sterling Publication Pvt. Ltd.
4) MadhukarkumarBhagat, Indian Heritage and culture, Access Publications.
5) Dhirendra Singh, Indian Heritage and culture, APH Publications.

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III B.Tech, I-Sem (ECE) | T | P | C
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(A0497205) LINEAR AND DIGITAL INTEGRATED CIRCUIT APPLICATIONS LAB

COURSE OBJECTIVES:
- To study OPAMPS, Classification of Op-Amps.
- To study and design various linear and non-linear applications of Op-Amps.
- To study and design various applications of IC 555 timer.
- To study Analog filters and Converters.
- To study combinational and sequential circuits using digital ICs.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Implement at linear and non-linear applications using op-amp
- Design and implement the active filters and converter using op-amp
- Design and Implement at Monostable and Astable multivibrators using 555 IC.
- Implement at combinational circuits using digital ICs.
- Implement at sequential circuits using digital ICs.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1							3				2	2	1
CO2		2	3						3		1		2	3	1
CO3		2	3						3		1		2	3	1
CO4		2	3						3		1		2	3	1
CO5	1	2							3				1	1	2

Minimum 10 experiments to be performed

PART -A: LINEAR IC APPLICATIONS
1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and differentiator using 741 Op-Amp.
3. Function Generator using OP AMPs.
4. Active Filter Applications – LPF, HPF (first order)
5. DAC using OP AMP.
6. IC 555 Timer – Astable and Monostable Operation Circuit
7. Schmitt trigger using 741 Op-Amp.

PART – B: DIGITAL IC APPLICATIONS
1. Study of Logic gates - IC 74XX.
2. 3 to 8 decoder - IC 74X138.
3. 4- bit comparator – IC 7485.
4. 8 to 1 MUX - IC 74X151 and DEMUX - IC 74X155.
5. D, JK Flip Flop - IC 7474, IC 74X109.
6. Universal Shift Register - IC 74X194.
7. Synchronous binary counter- IC 74X163.

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(A0498205) ANALOG COMMUNICATION LAB

Hardware and Simulation using MATLAB

COURSE OBJECTIVES:

- To study the various steps involved in generating different analog modulation techniques.
- To study the process of detecting different analog modulation techniques.
- To study different pulse modulation techniques.

COURSE OUTCOMES:

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

- Comprehend different Analog Modulation Systems.
- Analyse the operation of each device in various types of modulation systems.
- Design and conduct experiments of different Analog modulation systems, in order to interpret the results.
- Demonstrate the skill to use modern engineering tools like CAD tools.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1										2		
CO2	3	3	2	1	1				1	2			2		
CO3	1	3	3	2	1	1			2	1		2		3	2
CO4		2	2	1	3				2	1	1	2			3

Minimum 10 experiments should be conducted:

PART-A:

1. Amplitude modulation and demodulation.
2. Diode detector characteristics.
3. Balanced modulator & Synchronous detector.
4. SSB modulation & demodulation system.
5. Frequency modulation and demodulation.
6. Pre-emphasis & De-emphasis.

PART-B:

Modelling of Analog Communication Using MATLAB

1. Amplitude Modulation and Demodulation Technique.
2. DSB-SC Modulation and Demodulation Technique.
3. FM Modulation and Demodulation Technique.
4. SSB Modulation and Demodulation Technique.
5. PWM Modulation and Demodulation Technique.
6. PPM Modulation and Demodulation Technique.

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III B.Tech, II-Sem (ECE)

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(A0423206) DIGITAL SIGNAL PROCESSING
For branches: EEE & ECE

COURSE OBJECTIVES:
The course content enables students to:
- Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
- Develop ability among students for problem formulation, system design and solving skills
- Demonstrate basic knowledge of Digital Signal Processing by understanding various transformations
- Understand Various Discrete-time signals and classification of linear shift-invariant systems will be studied using the convolution sum, and the frequency domain transformations.
- Design of systems with digital network composed of adders, delay elements, and coefficient multipliers.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Utilize FT.
- Implement DFT's using FFT.
- Determine and implement the appropriate type of design method for IIR filters.
- Determine and implement the appropriate type of design method for FIR filters.
- Choose appropriate decimation and interpolation factors for high performance filters

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2								1			2	1	
CO2	3	2			1							1	2		1
CO3	2	3												2	1
CO4	2	3												1	2
CO5	2	2	1									1	1	2	1

UNIT I
INTRODUCTION: Review of discrete-time signals and systems-Time domain analysis of discrete-time signals and systems, Frequency domain analysis of discrete –time signals and systems.
Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, and Computation of DFT, The relationship between DFT to other transforms.

UNIT II
FAST FOURIER TRANSFORMS: Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms, Inverse FFT.

UNIT III
REALIZATION OF DIGITAL FILTERS: Basic structures of IIR systems: Direct form-I realization, Direct form-II realization, Cascade form realization, Parallel form realization, Basic structures of FIR systems: Direct form realization, Cascade form realization, Lattice structures of IIR systems, Lattice structures of FIR systems. Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure.

UNIT IV

IIR DIGITAL FILTERS: Analog filter approximations using Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain, Illustrative Problems.

UNIT V

FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Digital Filters Using Fourier series, Window Techniques, Frequency Sampling Technique, Comparison of IIR and FIR filters, Illustrative Problems.

UNIT VI

MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS: Basic Sampling Rate Alteration Devices, Multirate Structures for Sampling Rate Converters, Multistage Design of Decimator and Interpolator, Poly-Phase Decomposition.

APPLICATIONS OF DSP: Speech coding, Digital processing of Audio signals and Radar signal processing and DSP based Measurement system.

TEXT BOOKS:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2013.
2. Digital signal processing, A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 4th edition, 2013.
3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, PHI, 3rd ed., 2009.

REFERENCES:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publishing House Pvt. Ltd., 2009.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2nd ed., 2011.
4. Digital Signal Processing by Ramesh Babu, Scitech Publications, 6th ed., 2015.

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(A0424206) MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION

COURSE OBJECTIVES:
- To analyse microwave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
- To explain how microwave devices and circuits are characterized in terms of their S-Parameters.
- To use microwave components such as isolators, Circulators, Tees, Gyrators etc.
- To give students an understanding of basic microwave devices (both amplifiers and oscillators).
- To learn the basic concepts of fibre optics communications.
- To make the students learn the system with various components or process for various applications.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Apply the knowledge of mathematics for analyzing the propagation of different microwaves in different transmission lines.
- Analyze the working principles of different wave guide components using S-parameters.
- Study the performance of specialized microwave tubes such as klystron, reflex klystron, magnetron, travelling wave tube and different solid-state devices.
- Attain the knowledge of basic optical fiber communication systems and learn the latest trends in optical communications.
- Recognize and classify the structures, types and channel impairments like losses and dispersion in optical fibers.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1												
CO2		3	2										1	2	
CO3		2		1										1	
CO4	2	2	1										1		2
CO5	1	3	2										2	1	

UNIT I
Introduction, Advantages and applications of Microwaves.

Guided Waves: Introduction, Transverse Electric waves (TE), Transverse Magnetic waves(TM), TEM Modes – Concepts, expressions and Analysis, Cutoff Frequencies, Velocities, Wavelengths expressions. Wave equations of rectangular waveguides, Propagation of TE and TM waves in rectangular waveguide, Filter Characteristics- Dominant and Degenerate Modes. Mode Characteristics – Phase and Group Velocities, Wave Impedance Relations, Illustrative Problems.

UNIT II
Waveguide Components and Applications: Scattering Matrix– Significance, Formulation and Properties. S Matrix Calculations for – Two port Junction, E plane and H plane Tees, Magic Tee, Two hole Directional Coupler, Ferrites Composition and Characteristics, Faraday rotation; Ferrite Components- Gyrator, Isolator, Circulator.

UNIT III
Microwave Amplifiers and oscillators: Microwave Tubes: (i) Linear Beam Tubes: Two

cavity Klystron amplifier –Construction, Operation, Applegate diagram, output power and efficiency. Reflex Klystron oscillator-Construction, Operation, Applegate diagram output power and efficiency. Travelling Wave Tube (TWT) –Construction, Operation, amplification process and Gain considerations. (ii) Crossed Field Tubes :Magnetron oscillator-Construction, pi-mode operation, power output and efficiency.

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes, Parametric Amplifier.

UNIT IV

Overview of Optical Fiber Communication: Historical development, the general system, Advantages of optical fiber communications. Introduction to Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Mode Field Diameter.

UNIT V

Signal degradation in optical fibers: Signal attenuation- absorption, scattering losses, Bending Losses, Core and Cladding losses, Group delay, Dispersion-Material dispersion, waveguide dispersion, Inter model dispersion.

UNIT VI:

Optical Sources and Detectors: Introduction, LEDs–structure –Light source, Quantum efficiency, Modulation of an LED, LASER diodes, Source to Fiber power launching, Fiber Splicing, Optical Fiber connectors, Photodiodes– Principle of Photodiodes, Avalanche Photodiodes, detector response time, Comparison of Photo diodes.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Optical Fiber Communications – Gerd Keiser, Mc GrawHill International edition, 4th Edition, 2008.
4. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCES:

1. Elements of Microwave Engineering – R. Chatterjee, Affiliated EastWest Press Pvt. Ltd., New Delhi, 1988.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
3. Microwave Engineering by Pozar,
4. Microwave Engineering and its applications by Om.P.Gandhi.
5. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
6. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
7. Electronic and Radio Engineering – F.E. Terman, McGrawHill, 4th ed., 1955.
8. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998
9. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
10. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rdEdiition, 2004.
11. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

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III B.Tech, II-Sem (ECE)

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(A0425206) DIGITAL COMMUNICATION

COURSE OBJECTIVES
- To understand, analyze, and design fundamental digital communication systems.
- To understand digital communication systems by using a series of specific examples and problems.
- To understand the analysis and design of modern digital communication systems.
- To Analyse and design noise-free digital communication systems

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Formulate the merits and demerits of various digital modulation systems in order to evaluate their performance based on output Signal-to-Noise Ratio [SNR] and transmission bandwidth.
- Apply the knowledge of digital electronics and signals & systems to evaluate Power spectral density [PSD] and Error Probability [P_e] of various digital modulation techniques [binary and m-ary].
- Design a digital communication system with error control sub-systems by applying various coding Techniques.
- Analyse the performance of the communication system by the mathematical study of information in the form of symbols, impulses.
- Design a digital communication system with error control subsystems by applying block and cyclic code techniques.
- Design a digital communication system with error control subsystems by applying convolution coding techniques including 5G communications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3										2	
CO2	3	3	3	2	2										
CO3	3	3	3	3	2	1							1	2	
CO4	2	3	3			1								3	1
CO5	3	3	3	2	3	2									2
CO6	3	3	3	2	3	2									

UNIT I
Digitization Techniques for Analog Messages: Introduction - Importance of Digitization Techniques, Elements of Pulse Code Modulation (PCM) - Generation and Reconstruction, Quantization and Coding, Quantization Error, PCM with Noise, Commanding in PCM, Time Division Multiplexing (TDM), Delta Modulation, Adaptive Delta Modulation, Differential PCM Systems (DPCM), Adaptive Differential PCM Systems.

UNIT II
Base Band Digital Transmission: Digital Signals and Systems – Digital PAM Signals, Transmission Limitations, Power Spectra of Digital PAM, Noise and Errors – Binary Error Probabilities, Matched Filtering, Optimum Filtering. Raised Cosine Filter & Its Spectrum. Eye Diagrams, Zero ISI and Controlled ISI: Conditions on the shape of the pulse and data rate.

UNIT III
Band Pass Digital Transmission: Digital Modulation Formats, Coherent Binary Modulation Techniques: Coherent Binary ASK, Coherent BPSK and Coherent BFSK, Coherent Quadrature

Modulation Techniques: Coherent QPSK, Error Probability calculation of BASK, BPSK, BFSK, Signal Space representation of BPSK, BFSK, QPSK, Non Coherent Binary Modulation Techniques: Non-Coherent ASK, Non-Coherent FSK, DPSK. Introduction to M-ary Modulation Techniques.

UNIT IV

Information Theory: Uncertainty, Information and Entropy, Source Coding Theorem, Huffman Coding: Binary and Ternary; Shannon-Fano Coding; Discrete Memory-less Channels, Mutual Information, Channel Capacity, Channel Coding Theorem, Differential Entropy and Mutual Information for Continuous Ensembles, Channel Capacity Theorem.

UNIT V

Channel Coding-I: Linear Block Codes: Matrix Representation of Linear Block Codes, Syndrome Decoding, Minimum Distance Considerations; Error Detection and Correction of Linear Block Codes; Hamming codes, Numerical Problems ; Forward Error Correction Systems, Automatic Retransmission Query (ARQ) systems, Cyclic Codes: Generator Polynomial for the Cyclic Codes, Parity Check Polynomial, Encoder for Cyclic Codes, Calculation of the Syndrome, Introduction to Cyclic Redundancy Check (CRC) Codes, Numerical Problems in CRC.

UNIT VI

Channel Coding-II: Convolution Codes: Encoding of Convolution Codes using Time Domain Approach and Transform Domain Approach, Code Tree, Trellis Diagram and State Diagram, Maximum-likelihood Decoding of Convolution Codes – Viterbi Algorithm;. Low Density Parity Check (LDPC) Codes, Brief Introduction to Polar Codes;

TEXT BOOKS:

1. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5th Edition, 2010.
2. Digital Communications - Simon Haykin, John Wiley, 2005.

REFERENCES:

1. Herbert Taub& Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3rd Edition, 2009.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH, 2004.
3. Digital Communications by Bernard Sklar, Tata McGraw Hill,

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(A0421206) VLSI DESIGN
(Professional Elective-II)
For branches: EEE & ECE

COURSE OBJECTIVES:
- To know the fabrication process of CMOS technology and its layout design rules
- To study the concepts of CMOS inverters and their sizing methods
- To understand basic circuit concepts and designing Arithmetic Building Blocks.
- To have an overview of Low power VLSI.
- To know the concepts of power estimation and delay calculations in CMOS circuits.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Understand and calculate device and circuit parameters of MOSFET.
- Draw the Stick diagram and Layout diagrams for nMOS/CMOS circuits.
- Design basic logic functions with different logic styles and compare various logic design styles on their performance metrics.
- Study the importance of low power design and basic techniques for low power design.
- Impart the research skills and encourage continuous learning in the area of microelectronics and VLSI design.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2		2	3											1	
CO3	1	1	3												2
CO4						3	2						2		
CO5											2	3			2

UNIT I
Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS technologies Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Integrated Resistors and Capacitors, types of packages and significance.

UNIT II
Basic Electrical Properties: Basic Electrical Properties of MOS Circuits: Enhancement mode transistor action, $I_{ds}V_{ds}$ relationships, MOS transistor threshold Voltage, g_m, g_{ds}; Pass transistor, Inverter with n-type MOSFET Load, Enhancement load NMOS, Depletion Load NMOS, CMOS Inverter analysis and design, BiCMOS Inverters.

UNIT III
VLSI Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout: Lambda based CMOS Design rules for wires, Contacts and Transistors.Layout Diagrams for NMOS and CMOS Inverters and Gates.

UNIT IV
Basic Circuit Concepts: Sheet Resistance R_S and its concept to MOS, Area Capacitances of layers, standard unit of capacitance Cg, area capacitance calculations, The Delay unit, Inverter delays, estimation of CMOS inverter delay, Wiring Capacitances, Choice of layers.

UNIT V
Short-Channel Effects and Device Models: Scaling Theory, Threshold voltage variation,

Mobility Degradation, Velocity Saturation, Hot Carrier Effects, Output Impedance Variation with Drain-Source Voltage, MOS Device Models, Level 1, Level 2, Level 3, BSIM Series, Charge and Capacitance Modeling, Temperature Dependence, Process Corners, Analog Design in a Digital World.

UNIT VI

Introduction to Low Power VLSI: Introduction, overview of power consumption: Switching power Dissipation, Observation on switching power reduction, Short-circuit power dissipation, Leakage power dissipation, Low power design through voltage scaling: Influence of volatege scaling, power and delay, VTCOMS Circuits, MTCOMS Circuits, Pipelining approach, Estimation and optimization of switching activity: Concept of switching activity, Reduction of switching activity, Glitch reduction, Gated clock signals.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition.
2. CMOS digital integrated circuits analysis and design by SungMo Kand and Yusuf Leblebici, Tata McGraw Hill, 3rd edition.

REFERENCES:

1. Introduction to VLSI Circuits and Systems John. P. Uyemura, John Wiley, 2003.
2. Modern VLSI Design Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.
4. Principles of CMOS VLSI Design Weste and Eshraghian, Pearson Education, 1999.
5. Digital Integrated Circuits – A design perspective, John M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, Pearson Education, 2nd Edition.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III B.Tech, II-Sem (ECE)

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(A0426206) DIGITAL TV ENGINEERING
(Professional Elective-II)

COURSE OBJECTIVES:
- To study the basic principles and development of the TV systems
- To study the analysis and synthesis of TV pictures, receiver picture tubes and Television tubes
- To study the principles of monochrome television transmitter and receiver systems
- To study the various colour TV systems with greater emphasis PAL systems
- To study the advance topics in TV systems
- To learn protected skills for working with digital TV technology

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Analyse and understand Colour T.V System
- Understand fundamental techniques of Different T.V. standards.
- Understand Advanced T.V. Technology.
- Understand different video recording, display and its consumer application.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1											2		
CO2	1	1				1							1	2	
CO3			2			1	1							1	3
CO4			2				1						1		2

UNIT I Fundamentals of Television and Display
Television basics: Factors of TV systems, Composite video signal, Signal transmission and channel bandwidth etc.., Color TV systems, color fundamentals, mixing of colors, color perception, chromaticity diagram.

UNIT II TV Standards
NTSC, PAL, SECAM systems, color TV transmitter, high-level, low-level transmitters, color TV receivers, remote control, antennas for transmission. TV alignment and fault finding with Wobbuloscope and TV pattern generation, field strength meter

UNIT III Digital TV
Introduction to Digital TV, Principle of Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG1, MPEG2, MPEG4, Video compression ITU Standards (H). Digital TV recording techniques.

UNIT IV HDTV
HDTV standards and systems, HDTV transmitter and receiver/encoder, Digital TV satellite Systems, video on demand, CCTV, CATV, direct to home TV, set top box with recording facility, conditional access system (CAS), 3D TV systems, Digital broadcasting, case study (Cricket match, Marathon, Football match).

UNIT V Video Recorders
IP Audio and Video, IPTV systems, Mobile TV, Video transmission in 3G mobile System, IPod (MPEG4 Video player), Digital Video Recorders, Personal Video Recorders, WiFi Audio

/Video Transmitter and Receivers. Video Projectors, HD Video projectors, Video Intercom systems/ Video door phones.

UNIT VI Consumer Applications

Color TV Digital cameras, Camcoders, Handycams, and Digicams. Display devices: LED, LCD, TFT, Plasma, HDTV, CD/ DVD player, MP3 player, Blue Ray DVD Players, MPEG, and MP3.

TEXT BOOKS

1. Television and video Engineering, A. M. Dhake, TMH Publication.
2. Video Demystified, Kelth jack, Penram International Publication.
3. Audio Video Systems, R.G. Gupta, Technical Education.

REFERENCE BOOKS

1. S. P. Bali, “Color TV Theory and Practice”.
2. Bernard Grobb, Charles E, “Basic TV and Video Systems”.
3. Gulathi, “Monochrome & Color TV”.

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III B.Tech, II-Sem (ECE) | L | T | C
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(A0427206) INFORMATION THEORY AND CODING
(Professional Elective-II)

COURSE OBJECTIVES:
- To understand the concept of information
- To understand the limits of error free representation of information signals and the transmission of such signals over a noisy channel
- To design and analyse data compression techniques with varying efficiencies a per requirements
- To understand the concept of various theorems proposed by Shannon for efficient data compression and reliable transmission
- To have idea on the different coding techniques for reliable data transmission
- To design an optimum decoder for various coding schemes used.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Apply the knowledge of Shannon's source coding theorem and Channel coding theorem for designing an efficient and error free communication link.
- Analyse various coding schemes
- Design an optimum decoder for various coding schemes used.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	2	1	1						1		3	2	
CO 2	1	2	3	1									2	2	
CO 3	1	1	2	1	1								2	2	
CO 4	1	1	1	1	1						1	1	1	1	
CO 5	2	2	1	1	1								1	1	
CO 6	1	2	3	1	1						1		2	2	

UNIT I
Introduction to Information Theory: Concept of information, units, entropy, marginal, conditional and joint entropies, relation among entropies, mutual information, information rate. Source coding: Instantaneous codes, construction of instantaneous codes, Kraft's inequality, coding efficiency and redundancy Noiseless coding theorem , construction of basic source codes, Shannon – Fano Algorithm, Huffman coding,

UNIT II
Channel capacity – redundancy and efficiency of a channel, binary symmetric channel (BSC), Binary erasure channel (BEC) – capacity of band limited Gaussian channels

UNIT III
Continuous Sources and Channels: Differential Entropy, Mutual information, Waveform channels, Gaussian channels, Shannon – Hartley theorem, bandwidth, SNR trade off, capacity of a channel of infinite bandwidth, Shannon's limit.

UNIT-IV
Introduction to rings, fields, and Galois fields. Codes for error detection and correction – parity check coding – linear block codes – error detecting and correcting capabilities – generator and parity check matrices – Standard array and syndrome decoding

UNIT V

Perfect codes, Hamming codes, encoding and decoding Cyclic codes, polynomial and matrix descriptions, generation of cyclic codes, decoding of cyclic codes BCH codes, Construction and decoding, Reed Solomon codes

UNIT VI

Convolutional Codes – encoding – time and frequency domain approaches, State Tree & Trellis diagrams – transfer function and minimum free distance – Maximum likelihood decoding of convolutional codes – The Viterbi Algorithm. Sequential decoding.

TEXT BOOKS:

1. Simon Haykin: Digital Communication Systems, Wiley India, 2013.
2. P.S.Sathya Narayana: Concepts of Information Theory & Coding, Dynaram Publications, 2005

REFERENCES:

1. Bose, Information theory coding and cryptography, 3e McGraw Hill Education India , 2016
2. J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009
3. Kelbert & Suhov, Information theory and coding by examples, Cambridge University Press, 2013
4. Shu Lin & Daniel J. Costello.Jr., Error Control Coding: Fundamentals and Applications,
   2/e,Prentice Hall Inc., Englewood Cliffs, NJ,2004
5. D.E.R. Denning, Cryptography and Data Security, Addison Wesley, 1983.
6. David J.C Mackay, Information Theory, Inference and Learning Algorithms, Cambridge, 2005.
7. Paul Garrett, The mathematics of Coding Theory, Prentice Hall, 2004.
8. Das Mullick Chatterjee, Principles of Digital communication, Wiley Eastern Ltd, 1986

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III B.Tech, II-Sem (ECE)

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(A0428206) EMBEDDED SYSTEM CONCEPTS
(Professional Elective-II)

COURSE OBJECTIVES:
- To understand the importance of the embedded system in electronic system design.
- To know the fundamental concepts in embedded system design like memory organization, role of Buses.
- To identify the suitable software architecture for different applications.
- To understand the fundamental concepts of RTOS.
- To knows the Hardware /Software co-design methodology.
- To know the different case studies in embedded system design.

COURSE OUTCOMES
At the end of the course, the student will be able to:
- Compare embedded system design models using different processor technologies (single purpose, general-purpose, application specific processors
- Describe and compare the various types of peripherals used in embedded systems.
- Analyse a given embedded system design and identify its performance critical points.
- Use modern engineering tools necessary for integrating software and hardware components in embedded system designs.
- Utilize a top down modular design process to complete a medium complexity embedded system design project under instructor specified design constraints.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1			1					2		2		1	
CO2	3	2		2	1							2	2		
CO3	2	1										3	2		
CO4	3	3		2	1				2	2		2		1	2
CO5	2	1		2	1				1			3	1		1

UNIT I
An Introduction to Embedded Systems: An Embedded System, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded Software in a System, Embedded System – On – Chip (SOC) and in use of VLSI Circuit design technology.

UNIT II
Advanced Processor Architectures, Memory Organization: Introduction to Advanced architectures, Processor and Memory organization, Instruction level parallelism, Performance metrics, Memory types, Memory maps and addresses, Processor selection, memory selection

UNIT III
Devices and Communication Buses for Devices Network: IO types and examples, serial communication devices, parallel device ports, timer and counting devices, networked embedded systems, serial bus communication protocols, parallel bus device protocols: ISA, PCI, PCIX and advanced buses.

UNIT IV
Survey of Software Architectures: Round–Robin, Round-Robin with interrupts, Function Queue Scheduling Architecture, Real time operating System Architecture, Selecting architecture.

Introduction to RTOS: Tasks and Task states, Tasks and data, Semaphores and Shared data, Message queues, Mail boxes, and Pipes

UNIT V

Embedded Software Development Process and Tools: Introduction to Embedded software development process and tools, Host and Target machines, Linking and locating software, getting embedded software into the target system, Issues in Hardware /software design and Code sign.

UNITVI

Design Examples: Case Study of Embedded system design and coding for a coding for an automatic chocolate vending machine (ACVM), Case study of Digital camera hard ware and software architecture, Case study of communication between orchestra Robots, Embedded systems in automobiles, Case study of an embedded system for smart card, Case study of Mobile phone software for key inputs.

TEXT BOOKS:

1. Rajkamal, "Embedded systems: Architecture, Programming and Design", TMH
2. David Simon, "An embedded software primer", Pearson Education 2004.

REFERENCES:

1. Arnold S Burger, "Embedded system design", CMP
2. Steve Heath; Butterworth Heinenann, "Embedded systems design: Real world design", Newton mass USA 2002.

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III B.Tech, II-Sem (ECE)

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(A0532206) CYBER SECURITY
(Open Elective-II)
For branches: ECE & CSE

COURSE OBJECTIVES:
- This course provides insight knowledge about cybercrime and it portrays preventive measures the security policies and procedures that must be adapted to prevent the end user from cyber threats. It also conveys a basic knowledge on the how to analyse the cyber incidents through cyber forensic methods.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Students will be able to gain the knowledge on cybercrime and the challenges and threats in cyber security.
- Students will have knowledge on External and Internal reconnaissance through various tools.
- Students will have better understanding upon how the system is compromised and user identity is compromised.
- Students will have an effective knowledge on web and mobile security
- Students will be aware on the ethics and policy guidelines that must be followed.
- Students will be given a fundamental knowledge on Cyber Forensics

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1								2	2	1	1
CO2	2	2	2	2	3								3	3	2
CO3	1	2	2	1			1					2	2	2	2
CO4	2	1	3				2					1	2	2	2
CO5	2	2	3	1		2	1	3		2				1	1
CO6	3	2	3	3	2	2	1	1				2	2	2	1

UNIT I

Introduction to cybercrime- classification of cybercrime – Reasons for commission of cybercrime – Malware and its types – Kinds of cyber crime

Security Posture: The current threat landscape- Cyber security challenges- Enhancing your security posture- The Red and Blue Team

UNIT II

Understanding the Cyber security Kill Chain: External reconnaissance - Internal reconnaissance - Access and privilege escalation – Sustainment – Assault –Obfuscation - Threat life cycle management.

UNIT III

Compromising the System: Analyzing current trends – Phishing-Exploiting a vulnerability-Zero-day-Performing the steps to compromise a system.

Chasing a User's Identity: Identity is the new perimeter- Strategies for compromising a user's identity -Hacking a user's identity

UNIT IV

Web & Mobile security: Introduction – Fundamental concepts and approaches - Appification-Webification – sandboxing - permission dialog based access control – Web PKI and HTTPS-Cookies – Password and Alternatives – Frequent software updates - Client side vulnerabilities

and mitigation: Phishing & clickjacking – client side storage- physical attacks. Server-side vulnerabilities and mitigation.

UNIT V

Security Policy: Reviewing your security policy - Educating the end user - Policy enforcement - Monitoring for compliance

Legal issues and Ethics: Protecting programs and data – Information and Law-Rights of Employees and Employers- Computer Crime- Ethical issues in computer security.

UNIT VI

Computer Forensics: What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Recourses/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer Forensics Technology

TEXT BOOKS:

1. The Cyber Security Body of Knowledge, version 1.0 by Awais Rashid, The National Cyber Security Centre 2019.
2. Introduction to cyber crime, by Jeetendra Pande, Uttarakhand Open University, Haldwani
3. Security in computing by Charles p pfleeger, Pearson Education; Fifth edition
4. Computer Forensics, Computer Crime Investigation by John R,Vacca, Firewall Media, New Delhi

REFERENCE BOOKS:

1. Information Security and Auditing in the Digital Age: A Practical Managerial Perspective Amjad Umar
2. Cybersecurity: Attack and Defense Strategies: Infrastructure security with Red by Erdal Ozkaya and Yuri Diogenes
3. Cyber Security Audit A Complete Guide - 2020 by Gerardus Blokdyk
4. Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software By Michael Sikorski, Andrew Honig
5. Information Technology Control and Audit" by Angel R. Otero

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(A0533206) ETHICAL HACKING
(Open Elective-II)

COURSE OBJECTIVES:
- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- To understand the Impacts of Hacking and vulnerability analysis;
- To gain an understanding on the Security models and Information Security Program
- Develop an idea about Business Perspective and Planning a Controlled Attack.
- Gain knowledge about how to prepare for hacking.
- Understand about Enumeration and Exploitation
- Understand about document preparation and presentation integration.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PS01	PS02	PS03
CO1		1	1		1			2	1			1		1	1	1
CO2	2	2	1	1	1							1		1	1	1
CO3		2	1	1				1	1					1		2
CO4		1		1										1	1	2
CO5	1	1							1						1	1
CO6	1	1		1										1	1	1

UNIT I
Introduction: Hacking Impacts, The Hacker Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Final Analysis, Deliverable, Integration Information.

UNIT II
Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture Information Security Program: The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking

UNIT III
The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges Planning for a Controlled Attack: Inherent Limitations, Imposed Limitations, Timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement

UNIT IV
Preparing for a Hack: Technical Preparation, Managing the Engagement Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance

UNIT V
Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase **Exploitation:** Intutive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern

UNITVI

Deliverable: The Deliverable, The Document, Overal Structure, Aligning Findings, Presentation

Integration: Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident

Management, Security Policy, Conclusion

TEXTBOOK:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press

REFERENCE BOOKS:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning

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(A0513205) WEB PROGRAMMING
(Open Elective-II)
For branches: EEE, ECE, CSE & CSE(DS)

COURSE OBJECTIVES:
- To learn client side scripting like HTML, JavaScript and server side scripting like servlets, JSPs.
- To focus on XML and web servers and database interfacing.
- To Use the "echo" and "print" to send output to the browser.
- To learn about how to create and use PHP basic and advanced concepts.
- To Write PHP programs that access form data

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Demonstrate the HTML important tags and for designing static web pages and separate design from content using CSS.
- Design a webpage with more user interactivity using JavaScript and understand the need of XML in the developing of Web applications.
- Understand the need of Server side scripting using Servlets and JSP along with database connectivity.
- Understand the syntax and basic concepts of PHP, conditional and looping statements, Arrays and Functions, strings and files
- Understand and develop programs on PHP object-oriented concepts and advanced concepts (cookies & sessions) and data and time functions.
- Develop a form containing several fields and be able to process the data with database using html & PHP-based script.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		1		1	1	1		1	2	1	1	1		1
CO2	1		2										1		
CO3	1		3	2	2			2	2	2	3	1	2	2	2
CO4	2	1	2		1					1			1		
CO5	1		2		2					1	1			1	1
CO6	1	1	3	2	1	2	2		3	2	3	1	1	2	2

UNIT I
Introduction to HTML - HTML common tags, HTML program structure, Attributes, List, Tables, images, forms, Frames, Cascading Style sheets

UNIT II
JavaScript - Introduction to Java Scripts, Data Validation using Java Script.
XML - Document type definition, XML Schemas, Document Object model, Presenting XML.

UNIT III
Web Servers and Servlets: Introduction to Servlets, Lifecycle of a Servlet, A Simple servlet, The Servlet API, Reading Servlet Parameters, Handling Http Request & Responses.
JSP Application Development - Using Scripting Elements, Implicit JSP Objects, Sharing Session and Application Data.
Database Access- Database Programming using JDBC, Types of JDBC Drivers, Accessing a Database from a servlets and JSP.

UNIT IV

Introduction to PHP: Features of php, Basic Syntax, Php variables, Php Data types, Type casting, Operators and Expressions, control statements and Lopping statements, introduction to arrays, array functions, stings-Its related library functions, functions- parameter passing techniques, Recursive functions.

UNIT V

Object oriented programming concepts, PHP Advanced Concepts- Cookies, Sessions.

Working with Date and Time-Displaying Human-Readable Dates and Times, Finding the Date for a Weekday, Getting the Day and Week of the Year, Determining Whether a Given Year Is a Leap Year, Obtaining the Difference Between Two Dates, Determining the Number of Days in the Current Month, Determining the Number of Days in Any Given Month.

UNIT VI

Creating and Using Forms- Understanding Common Form Issues, Validating form input, Working with multiple forms, and Preventing Multiple Submissions of a form.

PHP and Database Access- Connecting to a MYSQL database, performing basic database operations.

TEXT BOOKS:

1. HTML Black Book – Steve Holzner.
2. The complete Reference Java 2 Fifth Edition by Patrick Naughton and Herbert Schildt. TMH
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. Beginning PHP and MySQL, 3rdEdition, Jason Gilmore, Apress Publications (Dream tech.).
5. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.

REFERENCES:

1. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
2. PHP 5.1, I. Bayross and S.Shah, The X Team, SPD.
3. Programming world wide web-Sebesta, Pearson.
4. Web Technologies, Uttam K. Roy, Oxford.
5. Core Servlets Andjavaserver Pages Volume 1: Core Technologies by Marty Hall and Larry Brown Pearson.
6. An Introduction to web Design and Programming –Wang-Thomson.

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(A0506203) COMPUTER ORGANIZATION & ARCHITECTURE
(Open Elective-II)
For branches: EEE, ECE & CSE

COURSE OBJECTIVES:
- To understand the structure, function, characteristics and performance issues of computer systems.
- To understand the design of the various functional units of digital computers.
- To understand the basic processing unit and how they are connected and how it generates control signals (using hardwired and micro programmed approaches).
- To understand the different types of memory and how they are related.
- To learn basics of Parallel Computing and Pipelining.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Learn about computer performance, computer design, and trade-offs between cost and performance as well as between hardware and software.
- Formulate and solve problems, understand the performance requirements of systems.
- Learn about how to communicate effectively and learn to think creatively and critically, both independently and with others.
- Design memory organization that uses banks for different word size operations.
- Learn about all the detailed design issues and circuits of each unit.
- Conceptualize instruction level parallelism.

MAPPING OF COs & POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		1	3						2				2		1
CO2	2		2	3	1									3	
CO3	3	2	1	2									1		
CO4		2		1				1		2					2
CO5			3	2								1	2		
CO6					3						2	1		3	

UNIT-1
Basic structure of computers: Computer Types, Functional unit, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.
Data representation: Fixed Point Representation, Floating Point Representation. Error Detection codes.

UNIT-2
Register transfer language and microoperations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations
Basic computer organization and design: Instruction codes, Computer Registers, Computer instructions, Instruction cycle, Memory- reference instructions, Input – Output and Interrupt.

UNIT-3
Central processing unit: Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Reduced Instruction set computer
Computer arithmetic: Fixed point operations - Addition and subtraction, multiplication, Division Algorithms

UNIT-4

The memory system: Basic concepts, semiconductor RAM memories, Read-only memories, Cache memories, performance considerations

UNIT-5

Pipeline and vector processing: Parallel processing, Arithmetic pipeline, Instruction Pipeline, RISC Pipeline, Vector processing, Array Processors.

UNIT-6

Multi processors: Characteristics of Multi Processors, Inter Connection Structures, Inter Processor Arbitration, Inter Processor Communication & Synchronization, Cache Coherence

TEXT BOOKS:

1) Computer Systems Architecture – M. Moris Mano, 10 Edition 2016, Pearson/PH
2) Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition 2011, McGraw Hill.

REFERENCES:

1) Computer Organization and Architecture–William Stallings Sixth Edition, 2012 Pearson/PHI
2) Dr. M. Usha, T. S. Srikanth, "Computer System Architecture and Organization", First Edition, Wiley- India.
3) "Computer Organization" by ISRD Group, Tata McGraw-Hill
4) https://en.wikipedia.org/wiki/Computer_architecture
5) https://onlinelibrary.wiley.com/doi/full/10.1002/9780470050118.ecse071

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(A0429206) DIGITAL DESIGN USING VERILOG
(Skill Development Course)

COURSE OBJECTIVES:
- To understand the basics of the Language Constructs and its conventions.
- To form an introduction to design and verify logic circuits through Verilog.
- To design various combinational designs like decoders, multiplexers using Verilog HDL
- To design various sequential designs like Flip-flops, Counters and shift operations using Verilog HDL

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand the basics of the Language and its conventions.
- Understand types of modeling, modules, and functions of Verilog and simulate related Programs.
- Become skilled in design through Verilog.
- Gain Knowledge of designing and simulating various combinational circuit designs using Verilog HDL
- Gain Knowledge of designing and simulating various Sequential circuit designs using Verilog HDL

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1													
CO2		2	2									1	1		
CO3		2	3	1								2	1	1	2
CO4	2	3	2	2								2	2	1	1
CO5	2	3	2	2								2		2	1

UNIT I
Verilog Hardware Description Language: Importance of HDL, Popularity of Verilog HDL, Program structure, Comparison of Verilog and VHDL, Language constructs and conventions, Logic Values, Data Types-Value Set-Nets-Registers-Vectors-Integer and Real register data type - Arrays-Parameters-Strings, Compiler directives.

UNIT II
Design elements: Continuous Assignment statements, Procedural Assignment Statements-Blocking and Non-Blocking procedural assignment, if statements, Case Statements, Structural design elements, Time dimension, Simulation.

UNIT III
Combination circuit modeling-I: Adders and Subtractors: Half adder, Full adder,74x283, Full Subtractor, Ripple carry adder, Carry-Look ahead adder, Decoders (74x139) (74x138),Seven segment decoder(74x49), Priority encoder (74X148)- Verilog codes

UNIT IV
Combination circuit modeling-II: Multiplexers: 74X151, 74X157, 74X153, 74X251, 74X257, EX-OR gates and parity circuits:74X86,74X280, Comparators-74X85,74X682-Verilog codes.

UNIT V

Sequential circuit modeling-I: Latches and flip-flops: 74X375 74X74, 74X109, 74X112,74x175, 74x174, 74x374, Counters: 74X163, 74X161, 74X160, Design of mod-N counters- Verilog codes

UNIT VI

Sequential circuit modeling-II: Shift register: 74X164, 74X166, 74X194, Ring counter, Johnson counter, Verilog codes.

Design Examples: Dual Priority Encoder, Floating Point Encoder.

TEXT BOOKS:

1. Digital Design Principles & Practices – John F. Wakerly, Pearson Education India, 4th Ed., 2008.
2. Verilog HDL-A Guide to Digital Design and Synthesis-Samir Palnitkar, Pearson India,2nd edition,2003

REFERENCES:

1. A VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.
2. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with Verilog, 2nd Edition, TMH, 2008
3. Digital design with an Introduction to the Verilog HDL- M. MORRIS MANO MICHAEL D. CILETTI, Pearson, 5th edition,2013
4. Z Navabi - Verilog Digital System Design, 2nd Edition, McGraw Hill, 2005.

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III B.Tech, II-Sem (ECE)

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(A0022203) CONSTITUTION OF INDIA
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To study the structure and composition of Indian Constitution
- To learn about the federalism in the Indian context.
- To Study the Panchayati Raj Institutions as a medium of decentralization
- To learn about the three organs of the state in the contemporary scenario.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Understand historical background of the constitutional making and its importance for building a democratic India.
- Be aware of the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
- Aware of Indian government, the structure of state government, the local Administration.
- Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions.

UNIT I
History of Indian Constitution: History of Making of the Indian Constitution - History Drafting Committee - Composition & Working of Constitution.

UNIT II
Philosophy of the Indian Constitution: Preamble Salient Features of Indian Constitution.

UNIT III
Contours of Constitutional Rights & Duties: Fundamental Rights: Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy.

UNIT IV
Organs of Governance: Parliament - Composition - Qualifications and Disqualifications Powers and Functions of Executive - President - Governor - Council of Ministers – Judiciary – Qualifications, Appointment and Transfer of Judges.

UNIT V
Local Administration: Role and Importance of Municipal Corporation Role and Importance Pachayati raj: Role and Importance Zilla Pachayat: Position and role - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT VI
Election Commission: Role and Functioning of Election Commission Role and Functioning of Chief Election Commissioner and Election Commissioners - Role and Functioning of State Election Commission.

TEXT BOOKS
1) Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2) The Constitution of India, PM Bhakshi, Universal Law

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III B.Tech, II-Sem (ECE) | T | P | C
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(A0481206) DIGITAL COMMUNICATION LAB

COURSE OBJECTIVES:

- To study the signal sampling by determining the sampling rates for baseband signals and reconstruct the signal.
- To study various modulation and demodulation process.
- To study the various steps involved in generating and degenerating different pulse modulation techniques.
- To study various modulation techniques using simulation process (MATLAB).
- To study the generation and demodulation of PSK, DPSK, FSK.

COURSE OUTCOMES:

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

- Study and comprehend the basics of Communication system and different Digital Modulation Systems.
- Analyse the operation of each device in various types of modulation systems.
- Design and conduct experiments of different Digital modulation systems, in order to interpret the results.
- Demonstrate the skill to use modern engineering tools like CAD tools.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1											1	
CO2	3	3	2	1	1				1	2				2	
CO3	1	3	3	2	1	1			2	1		2	3	1	
CO4		2	2	1	3				2	1	1	2		1	3

Minimum of 8 experiments to be conducted (Four from each Part-A&B)

PART-A

1. Sampling Theorem – verification.
2. Time division multiplexing.
3. Pulse code modulation.
4. Differential pulse code modulation.
5. Delta modulation.
6. Frequency shift keying.
7. Differential phase shift keying.
8. QPSK modulation and demodulation.

PART-B

Modeling of Digital Communications using MATLAB

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. QPSK modulation and demodulation.
9. Channel and its characteristics.

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(A0483206) DIGITAL SIGNAL PROCESSING LAB

COURSE OBJECTIVES:
- To design real time DSP systems and real world applications.
- Ability to apply knowledge of mathematics, science and engineering: Construction of tools for visualizing the basic concepts of discrete signal representation such as Fourier transforms, discrete time representations.
- Understand the concept of Multi-rate signal processing and sample rate conversion
- Students will learn numerous programming tools for design and implementations of filtering algorithms.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Able to analyze the systems using DTFT and DFT.
- Understand circular convolution, and how circular convolution can be achieved via the DFT.
- Alter the sampling rate of signal using decimation and interpolation.
- Able to design digital FIR filters using window method
- Able to design IIR filters by prototype method analog filters then transform to digital filters.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		2							1			1
CO2	2	2	1		2					1			1		
CO3	1	2	3		2										
CO4	2	1	2		2								2		
CO5	2	1	2		2								2		

Conduct any 10 Experiments of the following:

List of Experiments

The following experiments shall be conducted using MATLAB / Lab View / C Programming/ Equivalent software.

1) Simulation of discrete time systems.
2) Verification of DTFT properties
3) Comparison of Linear and Circular Convolution
4) Find DFT / IDFT of given discrete time signal
5) Implementation of FFT of given Sequence
6) Design and implementation of IIR filter using bilinear transformation and impulse invariant method.
7) Design and implementation of IIR Butterworth (LP/HP) filter.
8) Design and implementation of IIR Chebyshev (LP/HP) filter.
9) Design and implementation of FIR with low pass filter using any three windowing techniques. Plot its magnitude and phase responses.
10) Design and implementation of FIR filter with high pass filter using any three windowing techniques. Plot its magnitude and phase responses.
11) Design and implementation of FIR filter with band pass / band stop filter using any three windowing techniques. Plot its magnitude and phase responses.
12) Multirate signal processing techniques: Decimation and interpolation
13) Design of tunable digital filters.

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IV B.Tech, I-Sem (ECE)

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(A0430207) DIGITAL IMAGE PROCESSING
(Professional Elective-III)

COURSE OBJECTIVES:
- To learn the digital image fundamentals.
- To learn the sampling and reconstruction procedures.
- To learn the various transforms used in image Processing.
- To learn the various concepts of image enhancement, reconstruction and image compression.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Understand the basics of image processing, concepts of Image transforms.
- Choose appropriate technique for image enhancement both in spatial and frequency domains.
- Identify causes for image degradation and apply restoration techniques.
- Understand the concepts of different Image segmentation techniques.
- Choose the appropriate image compression techniques for their application.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									2		2	
CO2	2	3										1	1	1	
CO3	2	3										1			1
CO4	2	3										2	2		
CO5	2	3										3			2

UNIT I

DIGITAL IMAGE FUNDAMENTALS: Definition of an Image, Digital Image, and Digital Image Processing, Applications of Digital Image Processing(Brief Note), Fundamental Steps in Digital Image Processing, Components of an Image Processing System, A Simple Image Formation Model, Basic Concepts in Image Sampling and quantization, Representing Digital Images, Spatial and Gray Level Resolution(Brief Note), Some Basic Relationships between pixels, Imaging Geometry: Some Basic Transformations Translation, Rotation, Concatenation and inverse transformations.

UNIT II

IMAGE TRANSFORMS: Introduction to the 2D Fourier Transform, 2D Discrete Fourier Transform, Some Properties of 2D DFT, Other Separable Image Transforms: Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Hotelling transform.

UNIT III

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Background, Some Basic Gray Level Transformations: Image Negatives, Log Transformations, Power Law Transformations, Piecewise Linear Transformation Functions: Contrast Stretching, Gray Level Slicing, Bit Plane Slicing, Definition of Histogram, Histogram Processing: Histogram Equalization(Brief Note), Histogram Matching(Specification), Local Enhancement, Enhancement Using Arithmetic/Logic Operations: Image Subtraction, and Image Averaging(Brief Note), Basics of Spatial filtering: Smoothing and sharpening Filters(Brief Note).

IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN: Filtering in the Frequency Domain, Smoothing Filters: Ideal, Butterworth, and Gaussian Lowpass Filters, Sharpening Filters: Ideal, Butterworth, and Gaussian Highpass Filters.

UNIT IV

IMAGE RESTORATION: A Model of the Image Degradation/Restoration Process, Noise models, Restoration in the presence of noise only, Spatial filtering: Mean Filters, Order Statistics Filters, and Adaptive Filters, Periodic Noise Reduction by Frequency Domain Filtering: Bandreject, Bandpass, and Notch Filters, Linear, Position Invariant Degradations, Estimating the Degradation Function, Inverse filtering, Wiener Filtering.

UNIT V

IMAGE SEGMENTATION: Introduction, Detection of discontinuities: Point Detection, Line Detection, Edge Detection; Edge linking and boundary detection: Local Processing, Global Processing using Hough Transform, and Graph Theoretic Technique; Thresholding: Foundation, Role of Illumination, Global Thresholding, Adaptive Thresholding; Region based segmentation: Basic Formulation, Region Growing, Region Splitting and merging.

UNIT VI

IMAGE COMPRESSION: Fundamentals: Coding Redundancy, Interpixel Redundancy, psychovisual Redundancy, Fidelity criteria, Image compression models, Source encoder and decoder, Elements of Information Theory: Measuring Information; Error free compression: Variable Length Coding, Huffman Coding, Arithmetic Coding, LZW Coding, Bit Plane Coding, Run Length Coding, Lossless Predictive Coding; Lossy compression: Lossy Predictive Coding, and Transform Coding.

TEXT BOOK:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Education, 2002.
2. Digital image processing by S.Jayaraman, S.Esakkirajan & T.Veera Kumar, Tata McGraw Hill, 2010.

REFERENCES:

1. Fundamentals of Digital Image processing – A.K.Jain, PHI.
2. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.
3. Digital Image Processing – William K. Pratt, John Wilely, 3rd Edition, 2004.
4. Fundamentals of Electronic Image Processing – Weeks Jr., SPIC/IEEE Series, PHI.
5. Digital Image Processing with Matlab, Elsevier

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(A0432207) ADVANCED DIGITAL SIGNAL PROCESSING
(Professional Elective-III)

COURSE OBJECTIVES:
The course content enables students to:
- Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
- Develop ability among students for problem formulation, system design and solving skills
- Demonstrate basic knowledge of Digital Signal Processing by understanding various transformations
- Understand Various Discrete time signals and class of linear shift in variant systems will be studied using the convolution sum, and the frequency domain, using transformations.
- Design system with digital network composed of adders, delay elements, and coefficient multipliers.
- Enhance the basic digital filter structures and their realization diagrams.
- Understand the analysis of finite word length effects in signal processing.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Compare the performance of LMS and RLS algorithms in terms of speed of convergence for a given application.
- Choose an appropriate transform for the given signal
- Choose appropriate decimation and interpolation factors for high performance filters
- Model and design an AR system
- Implement filter algorithms on a given DSP processor platform.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											2		
CO2	2	2												2	
CO3	2	2											1	2	1
CO4	2	3	2									2	1		1
CO5	2	1	3									2	2		

UNIT I
OVERVIEW: Discrete Time Signals, Sequences and sequence Representation, Discrete Time Systems, Time Domain Characterization and Classification of LTI Discrete Time Systems. The Continuous Time Fourier Transform, The discrete Time Fourier Transform, energy Density Spectrum of a Discrete Time Sequence, Band Limited Discrete Time signals, The Frequency Response of LTI Discrete Time System.

UNIT II
LTI DISCRETETIME SYSTEMS IN THE TRANSFORM DOMAIN: Types of Linear Phase transfer functions, Simple Digital Filters, Complementary Transfer Function, Inverse Systems, System Identification, Digital Two Pairs, Algebraic Stability Test.

UNIT III
DIGITAL FILTER SRTUCTURE AND DESIGN: All Pass Filters, Tunable IIR Digital Filter, IIR Tapped Cascade Lattice Structures, FIR Cascaded Lattice Structures, Parallel All Pass Realization of IIR Transfer Functions, State Space Structures, Polyphone Structures,

Digital Sine Cosine Generator, Computational Complexity of Digital Filter Structures, Design of IIR Filter using pade' approximation, Least Square Design Methods, Design of Computationally Efficient FIR Filters.

UNIT IV

DSP ALGORITHEMS: Fast DFT algorithms based on Index mapping, Sliding Discrete Fourier Transform, DFT Computation Over a narrow Frequency Band, Split Radix FFT, Linear filtering approach to Computation of DFT using Chirp Z Transform.

UNIT V

POWER SPECTRAL ESTIMATION: Estimation of spectra from finite duration observation of signals, Nonparametric methods: Bartlett, Welch & Blackmann & Tukey methods. PARAMETRIC METHODS FOR POWER SPECTRUM ESTIMATION: Relation between auto correlation & model parameters, Yule Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

UNIT VI

APPLICATIONS OF DIGITAL SIGNAL PROCESSING: Dual Tone Multi frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non stationary Signals, Musial Sound Processing, Over Sampling A/D Converter, Over Sampling D/A Converter, Discrete Time Analytic Signal Generation.

TEXT BOOKS:

1. Digital Signal Processing by Sanjit K Mitra, Tata MCgraw Hill Publications.
2. Digital Signal Processing Principles, Algorithms, Applications by J G Proakis, D G Manolokis, PHI.

REFERENCES:

1. Discrete Time Signal Processing by A V Oppenhiem, R W Schafer, Pearson Education.
2. DSP A Practical Approach Emmanuel C Ifeacher Barrie. W. Jervis, Pearson Education.

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IV B.Tech, I-Sem (ECE)

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(A0439207) DSP PROCESSORS ARCHITECTURES AND APPLICATIONS
(Professional Elective-III)

COURSE OBJECTIVES:
- To understand the concept of DSP Architecture & comparison of this with that of microprocessors.
- To understand addressing modes, instruction sets, pipelining and application programs in TMS320C54XX processor
- To understand the architectural issues of programmable DSP devices and their relationship to the algorithmic requirements, architectures of commercially popular programmable devices and the use of such devices for software development and system design
- To highlight the suitability of programmable DSP devices for various application areas and motivate to design systems around these devices.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- To become familiar with fundamentals of DSP processors and architectures.
- To become familiar with computational accuracy in DSP implementations.
- To understand architectures of programmable DSP devices and processors.
- Students can able to implement basic DSP algorithms.
- To understand interfacing and applications of programmable DSP devices.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3		1									1		
CO2			1							3	2				1
CO3		3		1						2			2		2
CO4					3	2				1				2	
CO5							2			3		1			2

UNIT I
ARCHITECTURE OF DSP PROCESSOR (TMS320C5X): Introduction, Bus structure, Central Arithmetic Logic Unit(CALU),Auxiliary Register ALU (ARAU),Index Register(INDX),Auxiliary Register Compare Register(ARCR),Block Move Address Register(BMAR)Block Repeat Registers(RPTC,BRCR, PASR,PAER), Parallel Logic Unit(PLU),Memory Mapped Registers, Program Controller, Some flags in the status registers

UNIT II
COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT III
ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT IV
PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Commercial Digital signal

processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, OnChip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT V

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Quotation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, Implementation of FFT algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit Reversed index generation, An 8Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VI

INTERFACING &APPLICATIONS OF PROGRAMMABLE DSP DEVICES: DSP based Biotelemetry receiver, A speech processing system, An Image processing system, Memory interfacing, Synchronous serial interface, MCBSP, A CODEC interface circuit.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.

REFERENCES:

1. Digital Signal Processing – Jonathan Stein, John Wiley, 2005.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

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IV B.Tech, I-Sem (ECE)

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(A0438207) RADIO FREQUENCY IDENTIFICATION
(Professional Elective-III)

COURSE OBJECTIVES:
The course content enables students to:
- Introduce and define radiofrequency identification or RFID.
- Identify the advantages and disadvantages of radiofrequency identification.
- Demonstrate the difference between radiofrequency identification and barcodes.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Students understand the technology and features of RFID.
- Students know the history and operation of RFID.
- To understand global privacy policy.
- Students aware of regulations of RFID.
- Students able to apply RFID technology for different areas.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1											1
CO2			2							3	1		2		
CO3		2		1						3					2
CO4					3	2				1					
CO5							1			3		2		2	1

UNIT I
UNDERSTANDING RFID TECHNOLOGY: Introduction, RFID Technology, The Elements of an RFID system, Coupling, Range, and Penetration, RFID Applications, Veri Chip and Mark of the Beast.

UNIT II
A HISTORY OF THE EPC: Introduction, The Distributed Intelligent Systems Center, Meanwhile, at Procter & Gamble, "Low Cost" RFID Protocols, "Low cost" Manufacturing, The Software and the Network, Privacy, Harnessing the Juggernaut, The Six Auto ID Labs, The Evolution of the Industry, The Creation of EPC global.

UNIT III
RFID AND GLOBAL PRIVACY POLICY: Introduction, Definitions of Privacy, Definitions of Personal Information, History of Current Privacy Paradigm, Mapping the RFID Discovery process, Functions and Responsibilities for chips, Readers, and Owners, Privacy as a Fundamental Human Right, Constitutional Rights.

UNIT IV
PRIVACY OF RFID: Introduction, Understanding RFID's Privacy Threats. RFID and the United States Regulatory Landscape.

UNIT V
REGULATION OF RFID: Introduction, Current State of RFID Policy, Individuals, Business, Government, Miscellaneous, Integrity and Security of the System, Government Access, Health Impact, Labor Impact

UNIT VI
APPLICATIONS: RFID Payments at ExxonMobil, Exxon Mobil Corporation, Transforming

the Battlefield with RFID, Logistics and the Military, RFID in the Pharmacy, CVS and Auto ID, Project Jump Start, RFID in the Store.

TEXT BOOKS:

1. Simson Garfinkel and Beth Rosenberg, "RFID Applications, Security, and privacy", Pearson Education
2. Steven Shepard, "Radio Frequency Identification", First edition, McGrawHill Professional.

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IV B.Tech, I-Sem (ECE)

L	T	C
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(A0431207) MOBILE COMMUNICATION
(Professional Elective-IV)

COURSE OBJECTIVES:
- To study the concept of cellular system design with frequency-reuse, cell sectoring and handoff techniques
- To understand GSM, CDMA mobile technologies their design issues and comparison
- To understand important features of advance technologies (higher generations) starting form 2.5 G to 5G.
- To learn and understand the basic principles of Telecommunication and Networks.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Attain the knowledge of fundamentals in cellular radio system design and its evolution.
- Analyze radio channel and cellular capacity
- Design and apply concepts of mobile cellular systems like GSM, CDMA.
- Understand emerging technologies for fourth generation mobile systems such as LTE and 5G

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	3	2											2		
CO3	3	2	3										3	2	
CO4							2					2		2	2

UNIT I
INTRODUCTION TO CELLULAR MOBILE SYSTEMS:A basic cellular system, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Elements of mobile radio system design, General description of the problem, concept of frequency channels, Cochannel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting.

UNIT II
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, constant standard deviation, 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 III
FREQUENCY MANAGEMENT, CHANNEL ASSIGNMENT AND HANDOFF: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells. Handoff: types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff

UNIT IV
GSM ARCHITECTURE AND INTERFACE: Global system for mobile (GSM), GSM architecture, GSM Air specifications, GSM Channels, Mobility management, Network

Signaling, Spectral efficiency calculations with multiple access technologies like TDMA, FDMA,CDMA Comparison .

UNIT V

Code Division Multiple Access: CDMA technology, RAKE receiver, IS 95 system Architecture, Air Interface, Forward Link, Reverse link, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Comparison of GSM and CDMA technology, Spectral efficiency calculations for CDMA.

UNIT VI

Higher Generation Cellular Standards: 4G Introduction and vision, LTE enabler Technologies: OFDMA, SC-FDMA, MIMO etc. Adaptive multiple antenna techniques, radio resource management, QOS requirements for 4G. LTE Network architecture, interfaces and node functionalities.

Introduction to 5G: Drivers for 5G, 5G Roadmap and Vision, 5GEnabler technologies / Key building Blocks (High Level View), 5G current state, Recent Trends in Telecommunication Industries.

TEXT BOOKS

1) Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2) T.S.Rappaport, “Wireless Communications Principles and Practice”, II Ed. PHI
3) V.K.Garg, “IS-95 CDMA & CDMA 2000”, Pearson Education.

REFERENCE BOOKS

1) J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education
2) Krzysztof Wesolowski, “Mobile Communication Systems”, Wiley Student Edition.
3) Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press
4) John C. Bellamy, “Digital Telephony”, Third Edition; Wiley Publications
5) Fundamentals of 5G Mobile Networks - By: Jonathan Rodriguez, Publisher: John Wiley & Sons

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV B.Tech, I-Sem (ECE)

L	T	C
2	1	3

(A0435207) SATELLITE COMMUNICATION

(Professional Elective-IV)

COURSE OBJECTIVES:

- To introduce the basic principles of Satellite Communication systems, orbital mechanics, launchers.
- To know the different subsystems of satellites.
- To introduce the basic concepts and designing of Satellite links.
- To introduce the basic concepts of earth station transceiver.
- To know the basics of direct broadcast satellite television
- To know the basic concepts of various multiple access techniques and GPS systems.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- To introduce the basic principles of satellite communication system, orbital mechanics and launchers.
- To understand the concepts of satellite subsystems and designing of satellite uplink and downlinks.
- To analyze the concepts of various multiple access techniques.
- To introduce the basic concepts of direct broadcast satellite television and radio.
- To know the concepts of global positioning system and its operation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		1										2	
CO2			3							2	1		2		
CO3		2		1						3			2		2
CO4					3	1				2				1	
CO5							1			3		2			1

UNIT I

INTRODUCTION: Background, A brief history of satellite communications, Overview of Satellite Communications, Frequency allocations of satellite services, Design considerations of Satellite Communications, Advantages, Disadvantages and Applications of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics: Developing the Equations of the Orbit, Kepler's Three Laws of Planetary Motion, Describing the orbit of a satellite, Locating the satellite in the orbit, Locating the satellite with respect to the earth, Orbital elements. Look Angle determination: The Subsatellite Point, Elevation Angle Calculation, Azimuth Angle Calculation, and Specialization to Geostationary Satellites, Orbital Perturbations: Longitudinal and Inclination changes. Orbit Determination. Launches and Launch Vehicles: Expendable Launch Vehicles, Placing Satellites into Geostationary Orbit. Orbital Effects in Communications Systems Performance, Orbit Considerations.

UNIT II

SATELLITE SUBSYSTEMS: Attitude and Orbit Control System (AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems, Description of the Communications System, Transponders, Satellite antennas: Basic Antenna Types and Relationships. Equipment Reliability and Space Qualification, Redundancy.

UNIT III

SATELLITE LINK DESIGN: Introduction, Basic Transmission Theory, System Noise

Temperature and Gain to Temperature (G/T) ratio: Noise Temperature, Calculation of System Noise Temperature, Noise Figure and Noise Temperature, G/T Ratio for Earth Stations. Design of Downlinks: Link Budgets, Link Budget Example.
Uplink Design and Example. Design of Satellite Links for Specified Carrier to Noise (C/N): Combining C/N and C/I Values in Satellite Links, Overall $(C/N)_0$ with Uplink and Downlink Attenuation, Uplink and Downlink Attenuation in Rain, Uplink Attenuation and $(C/N)_{up}$, Downlink Attenuation and $(C/N)_{dn}$. Satellite Communication Link Design Procedure.

UNIT IV

MULTIPLE ACCESS: Introduction, Frequency Division Multiple Access (FDMA): Intermodulation, Calculation of C/N with Intermodulation. Time Division Multiple Access (TDMA): Bits, Symbols, and Channels, TDMA Frame structure, Reference Burst and Preamble, Guard Times, Synchronization in TDMA Networks, Transmitter Power in TDMA Networks, Satellite Switched TDMA, Onboard Processing: Baseband Processing Transponders, Satellite Switched TDMA with Onboard Processing. Demand Access Multiple Access (DAMA), Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

UNIT V

DIRECT BROADCAST SATELLITE TELEVISION AND RADIO: C-Band and Ku-Band Home Satellite TV, Digital DBS-TV, DBS-TV Link Budget, Master Control Station and Uplink, Installation of DBS-TV Antennas, Satellite Radio Broadcasting.

UNIT VI

SATELLITE NAVIGATION AND THE GLOBAL POSITIONING SYSTEM: Introduction, Radio and Satellite Navigation, GPS Position Location Principles: Position Location in GPS, GPS Time, and Selective Availability. GPS Receivers and Codes: The C/A Code. Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing Accuracy, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE Wiley Publications, 3rd Edition, 2021.
2. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2017.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication – Dr.D.C Agarwal, Khanna Publications, 7th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2013

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IV B.Tech, I-Sem (ECE)

L	T	C
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(A0434207) SPREAD SPECTRUM COMMUNICATION
(Professional Elective-IV)

COURSE OBJECTIVES:
- To understand the general concepts of spread spectrum
- To generate spread spectrum signals.
- To study various applications of spread spectrum.
- To learn the working operation of CDMA systems.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Demonstrate knowledge in various types of spread spectrum and code division multiple access digital cellular systems and generation and detection of spread spectrum signals.
- Analyse problems in direct sequence and avoidancetype spread spectrum systems.
- Design and develop spread spectrum communication systems.
- Choose proper multiple accessing methods depending on channel model.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1					1	2	2							2	
CO2	2				2	2	1					2	2		
CO3	2				2	2	1								2
CO4	1				2		2						1	2	1

UNIT I
FUNDAMENTALS OF SPREAD SPECTRUM: General concepts, Direct sequence (DS)), Pseudo noise (PN), Frequency hopping, Time hopping, Comparison of Modulation methods, Hybrid spread spectrum systems, Chirp spread spectrum, Base band modulation techniques.

UNIT II
ANALYSIS OF DIRECT SEQUENCE SPREAD SPECTRUM SYSTEMS: Properties of PN sequences, Classes of periodic sequences, Properties of m sequences, Partial correlation, PN signal from PN sequences, Partial correlation of PN signals, The PN signal, Dispreading the PN signal, Interference rejection, Output signal to noise ratio, Antijam characteristics, Interception, Energy bandwidth efficiency.

UNIT III
ANALYSIS OF AVOIDANCETYPE SPREAD SPECTRUM SYSTEMS: The frequency hopped signal, Interference rejection in a frequency hopping receiver, the time hopped signal. GENERATION OF SPREAD SPECTRUM SIGNALS: Shift register sequence generators, discrete frequency synthesizers, SAW device PN generators, Charge coupled devices, Digital tapped delay lines.

UNIT IV
DETECTION OF SPREAD SPECTRUM SIGNALSTRACKING: Coherent direct sequence receiver, other method of carrier tracking, Delay lock loop analysis, TauDither loop, Coherent carrier tracking, Non coherent frequency hop receiver.
DETECTION OF SPREAD SPECTRUM SIGNALSACQUISITION: Acquisition of spread spectrum signals, Acquisition cell by cell searching, Reduction of acquisition time,

Acquisition with matched filters, Matched filters for PN sequences, Matched filters for frequency hopped signals, matched filters with acquisition aiding waveform.

UNIT V

APPLICATION OF SPREAD SPECTRUM TO COMMUNICATIONS: General capabilities of spread spectrum, Multiple access considerations, Energy and bandwidth efficiency in multi access, Selective calling and Identification, Antijam considerations, Error correction coding, Intercept consideration (AI), Miscellaneous considerations, Examples of spread spectrum system.

UNIT VI

CODE DIVISION MULTIPLE ACCESS DIGITAL CELLULAR SYSTEMS: Introduction, Cellular radio concept, CDMA Digital cellular systems, Specific examples of CDMA digital cellular systems.

TEXT BOOKS:

1. George.R.Cooper and Clare D.McGillem, Modern Communications and Spread Spectrum, McGraw Hill.
2. Roger L.Peterson, Rodger E.Ziemer & David E.Ziemer & David E.Both, Introduction to spread spectrum communications, Prentice hall, 1995.

REFERENCE BOOKS:

1. Dr.Kamilo Feher, Wireless Digital Communications: Modulation & Spread Spectrum Applications, PHI, 1999.
2. Upena Datal, Wireless Communication, Oxford Higher Education, 2009.
3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005.

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IV B.Tech, I-Sem (ECE)

L	T	C
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(A0441207) EMBEDDED SYSTEM DESIGN
(Professional Elective-IV)

COURSE OBJECTIVES:
- To study the embedded system design life cycle.
- To know the operating system concepts, types and choosing RTOS.
- To know the basics of hardware requirements for embedded system design.
- To study the basic hardware debugging techniques.
- To know the embedded software testing and debugging.
- To know how to write software for embedded system.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- To understand embedded system design life cycle.
- To understand how to select embedded system tools like RTOS, Processor etc.
- To understand the basics of hardware requirements for embedded system design.
- To understand the basic hardware debugging techniques.
- To understand the embedded software testing and debugging.
- To understand how to write software for embedded system.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	1	-	1	1	1	3	3	3	1
CO2	3	2	2	1	-	1	1	-	1	1	1	1	2	2	2
CO3	3	2	2	2	1	1	1	-	1	1	1	1	1	2	2
CO4	3	2	2	1	3	1	1	-	1	1	1	1	2	2	2
CO5	3	2	2	1	2	1	1	-	1	1	1	1	3	2	2
CO6	3	3	2	2	3	1	1	-	1	1	1	3	3	2	2

UNIT I
Embedded Design Life Cycle: Introduction, Product Specification, Hardware/software partitioning, Iteration and Implementation, Detailed hardware and software design, Hardware/Software integration, Product Testing and Release, Maintaining and upgrading existing products.

UNIT II
Selection Process: Packaging the Silicon, Adequate Performance, RTOS Availability, Tool chain Availability, Other issues in the Selection process, partitioning decision: Hardware/Software Duality, Hardware Trends, ASICs and Revision Costs.

UNIT III
Development Environment: The Execution Environment, Memory Organization, System Startup. Special Software Techniques: Manipulating the Hardware, Watchdog Timer, Flash Memory, Design Methodology. Basic Tool Set: Host – Based Debugging, Remote Debuggers and Debug Kernels, ROM Emulator, Logic Analyzer.

UNIT IV
BDM: Background Debug Mode, Joint Test Action Group (JTAG) and Nexus. ICE – Integrated Solution: Bullet Proof Run Control, Real time trace, Hardware Break points, Overlay memory, Timing Constrains, Usage Issue, Setting the Trigger.

UNIT V

Testing: The role of testing in embedded systems, Choosing Test cases, Testing Embedded Software, Performance Testing Maintenance and Testing.

Debugging techniques: Debugging techniques, the role of the development system.

UNIT VI

Writing Software for Embedded Systems: The compilation Process, Native Versus Cross-Compilers, Runtime Libraries, Writing a Library, Using alternative Libraries, using a standard Library.

TEXTBOOKS

1. Embedded System Design – Introduction to Processes, Tools, Techniques, Arnold S Burger, CMP Books, 2002.
2. Embedded Systems Design by Steve Heath, Newnes, 2nd edition 2003, EDN series for design engineers.

REFERENCES:

1. An embedded software primer by David E.Simon, Pearson education, 2008, Low price edition.

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IV B.Tech, I-Sem (ECE)

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(A0440207) RADAR SYSTEMS

(Professional Elective-V)

COURSE OBJECTIVES:

- This course describes the understanding of the components of a radar system and their relationship to overall system performance
- To become familiar with design, operation, and applications of various types of radar systems
- To understand clutter and its effects of radar system performance and learn the principle of target track and various types of radar antennas.
- To find the target information in the presence of noise.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- To become familiar with fundamentals of radar.
- To gain in knowledge about the different types of radar and their operation
- Students acquire knowledge on the different tracking radars and radar signal detection techniques.
- Students will demonstrate the ability to design a system component or process as per needs and specifications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3										1	2		
CO2			3		2				1						1
CO3				3		1	2						1	2	
CO4								1		3	2		2	1	

UNIT I

INTRODUCTION TO RADAR: Basic Radar, The Simple Form of the Radar Equation, Radar block Diagram and operation, Radar Frequencies, Applications of Radar.

THE RADAR EQUATION: Prediction of range performance, Minimum detectable signal, Receiver noise, Probability Density Functions, Signal to noise ratio, Integration of radar Pulses, Radar Cross section of Targets, Radar Cross section Fluctuations, Transmitter Power, Pulse Repetition Frequency and range ambiguities, Antenna Parameters, System Losses.

UNIT II

CW AND FREQUENCYMODULATED RADAR: The Doppler Effect, CW Radar, Frequency Modulated CW Radar, Air Borne Doppler Navigation, Multiple –Frequency CW Radar.

UNIT III

MTI AND PULSE DOPPLER RADAR: Introduction to Doppler and MTI Radar, Delay line Cancellers, Staggered Pulse Repetition Frequencies, Range gated Doppler Filters, Digital MTI Processing, Moving Target Detector, Limitations of MTI Performance, MTI from a moving Platform (AMTI), Pulse Doppler Radar.

UNIT IV

TRACKING RADAR: Tracking with Radar, Sequential Lobbing Conical scan and Mono pulse tracking, Target reflection characteristics and angular accuracy Low Angle Tracking, Tracking in Range, Other Tracking Radar Topics and Comparison of Trackers.

UNIT V

RECEIVERS AND DETECTION OF RADAR SIGNALS IN NOISE: The Radar Receiver, Noise Figure, Mixers, Low Noise Front Ends, Displays, Duplexers and Receiver Protectors; Matched Filter Receiver, Correlation Detection, Detection Criteria, Detector Characteristics, Performance of Radar Operator, Automatic Detection, Constant False Alarm Rate (CFAR) Receiver, ECMS & ECCMS.

UNIT VI

INFORMATION FROM RADAR SIGNALS: Introduction, Information available from a radar, Theoretical accuracy of Radar measurements, Ambiguity diagram, Pulse compression, Classification of targets with radar

TEXT BOOKS:

1. Introduction to Radar systems by Merrill I.Skolnik, Second edition, Tata McGraw Hill.

REFERENCES:

1. Introduction to Radar systems by Merrill I.Skolnik, 3rd edition, Tata McGraw Hill.

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IV B.Tech, I-Sem (ECE)

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(A0442207) OPTO ELECTRONIC DEVICES
(Professional Elective-V)

COURSE OBJECTIVES:
- Explain the physics of absorption, recombination and photoemission from semiconductors.
- Analyse different types of photo detectors based on their performance parameters.
- Discuss different LED structures with material properties and reliability aspects.
- Explain optical modulators and optical components
- Illustrate different types of lasers with distinct properties.

COURSE OUTCOMES:
At the end of the course, the student will be able to:
- Explain the property of absorption, recombination and photoemission in semiconductors.
- Illustrate different types of lasers with distinct properties
- Explain different LED structures with material properties
- Analyse different types of photo detectors
- Explain optical modulators and optical components.

MAPPING OF COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2			1											
CO2	1			2											
CO3	2		1												
CO4	2														
CO5	2		1												

UNIT I
Optical processes in semiconductors – electron hole recombination, absorption, Franz-Keldysh effect, Stark effect, quantum confined Stark effect, deep level transitions, Auger recombination heat generation and dissipation, heat sources.

UNIT II
Lasers – threshold condition for lasing, line broadening mechanisms, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, DBR lasers, quantum well lasers, tunneling based lasers, modulation of lasers.
Nitride light emitters, nitride material properties, InGaN/GaN LED, structure and working, performance parameters,

UNIT III
InGaN/GaN Laser Diode, structure and working, performance parameters. White-light LEDs, generation of white light with LEDs, generation of white light by dichromatic sources, generation of white light by trichromatic sources, temperature dependence of trichromatic, 7 generation of white light by tetrachromatic and pentachromatic sources, white-light sources based on wavelength converters.

UNIT IV
Optical modulators using pn junction, electro-optical modulators, acousto-optical modulators, Raman-Nath modulators, Franz-Keldysh and Stark effect modulators, quantum well electro-absorption modulators, optical switching and logic devices, optical memory.

UNIT V

Optical detection – PIN, APD, modulated barrier photodiode, Schottky barrier photodiode, wavelength selective detection, micro cavity photodiodes. Optoelectronic ICs, advantages, integrated transmitters and receivers, guided wave devices. Working of LDR, liquid crystal display, structure, TFT display, structure, polymer LED, organic LED.

UNIT VI

Introduction to optical components, directional couplers, multiplexers, attenuators, isolators, circulators, tunable filters, fixed filters, add drop multiplexers, optical cross connects, wavelength convertors, optical bistable devices.

TEXT BOOKS:

1. Pallab Bhattacharya: Semiconductor Optoelectronic Devices, Pearson, 2009
2. Yariv, Photonics Optical Electronics in modern communication,6/e ,Oxford Univ Press,2006.

REFERENCES:

1. Fundamentals of Photonics: B E Saleh and M C Teich, Wiley-Interscience; 1991
2. Bandyopadhay, Optical communicatoion and networks, PHI, 2014.
3. Mynbaev, Scheiner, Fiberoptic Communication Technology, Pearson, 2001.
4. Piprek, Semiconductor Optoelectronic Devices, Elsevier, 2008.
5. Alastair Buckley, Organic Light-Emitting Diodes, Woodhead, 2013.
6. Xun Li, Optoelectronic Devices Design Modelling and Simulation, Cambridge University Press,2009

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IV B.Tech, I-Sem (ECE)

L	T	C
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(A0437207) FPGA ARCHITECTURE AND APPLICATIONS

(Professional Elective-V)

COURSE OBJECTIVES:

- Study of PLDs, Classification of PLDs.
- To study CPLDS and FPGAs.
- To study and design with PLDs and FPGAS
- Study of Altera, Xilinx, Actel industry FPGAs.
- Study of Programming Technologies and Technology mapping for FPGAs.
- Study of FSM and realization of FSM

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Acquire Knowledge about various architectures and device technologies of PLD's and various FPGAs.
- Comprehend FPGA Architectures from different vendors.
- Describe FSM and different FSM techniques like petrinets& different case studies.
- Analyze System level Design and their application for Combinational and Sequential Circuits.
- Study the different case studies using one hot design methods.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3										2	1		
CO2		2										1	2	1	
CO3	3				2									1	
CO4	2		3										2		
CO5				3											2

UNIT I

PROGRAMMABLE LOGIC: ROM, PLA, PAL, PLD, FPGA – Features, Complex Programmable Logic Devices: ALTERA MAX 7000 CPLD, Speed Performance.

UNIT II

FPGA: Xilinx logic Cell array, CLB,I/O Block Programmable interconnect, Technology Mapping for FPGA: Library based, LUT based, Multiplexer based Technology Mapping.

UNIT III

CASE STUDIES: programming Technologies, Xilinx XC3000, XC4000, Actel FPGAs, Alteras FPGAs, Plus Logic FPGA, AMD FPGA, Quick Logic FPGA, Algotronix FPGA, Cross point solutions FPGA, FPGA Design Flow.

UNIT IV

FINITE STATE MACHINES (FSM): Finite State Machine– State Transition Table, State Assignments for FPGAs. Problem of the Initial State Assignment for One Hot Encoding.

UNIT V

REALIZATION OF STATE MACHINE: Derivation of SM Charts. Realization of State Machine Chart, Alternative Realization of State Machine Chart using Microprogramming. Linked State Machines. One–Hot State Machine, Petri nets for State Machines – Basic Concepts, Properties.

UNIT VI

FSM ARCHITECTURES: Architectures Centered Around Non Registered PLDs. State Machine

Designs Centered Around A Shift Register. Using Xilinx ISE EDA Tool Guidelines front end design for FPGAs

TEXT BOOKS:

1. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte), 1994.
2. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995.

REFERENCES:

1. Fundamentals of logic Design, 5/e, Charles H Roth.Jr.
2. S. Brown, R. Francis, J. Rose, Z. Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
3. Engineering Digital Design, 2/e, Richard F Tinder **Unit VI**.

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IV B.Tech, I-Sem (ECE)

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(A0436207) LOW POWER VLSI DESIGN
(Professional Elective-V)

COURSE OBJECTIVES:
The objective of this course is to provide students with
- Understanding of sources of power consumption of CMOS and BiCMOS circuits
- Knowledge of the scientific principles involved in fabrication of integrated circuits.
- Understanding of fabrication steps involved in fabrication process of MOSFET for CMOS and BiCMOS circuits.
- A comprehensive understanding of process integration and manufacturing for integrated circuits in emerging nanometerscale technologies.
- Understanding of Power Reduction Techniques and Low Power Logic design Styles.
- knowledge of MOSFET models and limitations of MOSFET models for analysis of digital CMOS and BiCMOS circuits
- Be able to create models of moderately sized CMOS and BiCMOS circuits that realize specified digital functions.
- Describe the general steps required for processing of CMOS and BiCMOS integrated circuits.

COURSE OUTCOMES: At the end of the course, the student will be able to:
- Capability to recognize advanced issues in VLSI systems, specific to the deep submicron silicon technologies.
- Students able to understand deep submicron CMOS technology and digital CMOS design styles.
- Students are able to understand the need of BiCMOS technology and different designs using BiCMOS technology
- To design chips used for battery powered systems and high performance circuits.
- At the end of the course students will have good understanding about low power modules and can able to design low power adders, multipliers and low power memory

MAPPING OF COs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		1							3		2	
CO2	2	2		3	2		1					3		2	
CO3	3	2										2			
CO4	3	3		2	1		1		2			2		3	
CO5	2	1		2	1				1			2			1

UNIT I
LOW POWER DESIGN, AN OVER VIEW: Introduction to low voltage low power design, limitations, Silicon on Insulator (SoI).

UNIT II
MOS/BiCMOS PROCESSES: BiCMOS processes, Integration considerations, BiCMOS Isolation considerations.

UNIT III
LOWVOLTAGE/LOW POWER CMOS/ BICMOS PROCESSES: Deep submicron processes, SOI CMOS.

UNIT IV

DEVICE BEHAVIOR AND MODELING: Advanced MOSFET models, limitations of MOSFET
models.

UNIT V

Sub half micron MOS devices: Analytical and Experimental characterization of sub half micron MOS devices, MOSFET in a Hybrid mode environment.

UNIT VI

CMOS AND BiCMOS LOGIC GATES: Conventional CMOS and BiCMOS logic gates, Performance Evaluation.

TEXT BOOKS:

1. CMOS/BiCMOS ULSI low voltage, low power by Yeo Rofail/ Gohl (3 Authors) Pearson Education Asia 1st Indian reprint, 2002.
2. Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002.

REFERENCES:

1. Basic VLSI Design, Douglas A.Pucknell & Kamran Eshraghian, 3rd edition PHI.
2. Digital Integrated circuits, J.Rabaey PH. N.J 1996
3. CMOS Digital ICs Sungmo Kang and yusuf leblebici 3rd edition TMH 2003.

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IV B.Tech, I-Sem (ECE)

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(A0543207) MACHINE LEARNING

(Open Elective-III)

For branches: ECE, CSE & CSE(DS)

COURSE OBJECTIVES:

- Basic knowledge about the key algorithms and theory that form the foundation of machine learning andcomputational intelligence
- A practical knowledge of machine learning algorithms and methods

COURSE OUTCOMES:

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

- Understand the principles, advantages, limitations and possible applications of machine learning.
- Identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.
- Provides a broad introduction to machine learning, data mining, and statistical pattern recognition.
- Understands a wide verity of learning algorithms and how to apply them on the data.
- Understand how to perform evolution of learning algorithms and model selection.
- Learn not only the theoretical underpinnings of learning but also gain practical know how needed to quickly and powerfully apply these techniques to new problems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1		2				2				1	1	2
CO2	3						2					1		1	1
CO3	2			2						1		2			1
CO4		3	1			1					2				1
CO5															1
CO6		2	1	1								2			1

UNIT – I

Introduction: Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

UNIT – II

Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification- zero–one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT – III

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT – IV

Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering.

UNIT – V

Component analysis: Principal component analysis, non-linear component analysis; Low dimensional representations and multi-dimensional scaling.

UNIT-VI

Stochastic methods: Introduction, Stochastic search, Boltzmann learning

TEXT BOOKS:

1. "Pattern classifications", Richard O.Duda, Peter E. Hart, David G. Stroke. Wiley student edition, Second Edition.

REFERENCE BOOKS:

1. "Pattern Recognition and Image Analysis" Earl Gose, Richard John baugh, Steve Jost.
2. "Introduction to Machine Learning" by Ethem Alpaydin, PHI 2nd Edition.

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IV B.Tech, I-Sem (ECE)

L	T	C
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(A0512205) CORE JAVA PROGRAMMING

(Open Elective-III)

For branches: EEE & ECE

COURSE OBJECTIVES:

After taking this course, the student should be able to:

- Describe the Windows event-driven programming model
- Build simple JAVA applications according to the model
- Write fluent JAVA code for creating classes
- Use JAVA variables, data, expressions and arrays
- Design and create forms, menus and controls
- Write clear, elementary Java programs (applets and applications)
- Use a Java-enabled browser and/or the applet viewer to execute Java applets
- Use the Java interpreter to run Java applications
- Design and construct effective graphic user interfaces for application software.
- Use Java Beans, RMI to build complex business applications

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand the syntax and concepts of JAVA
- Write JAVA programs to implementing Object Oriented Concepts
- Able to build directories and manage applications with interfaces
- Write JAVA programs that use data from flat files and databases
- Develop programs with error free and Multi-tasking.
- Program assignment utilizing Java GUI components, event listeners and event-handlers.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2				1		2	2	2	2	
CO2	2	1	3	2	2			1				3	1	2	1
CO3	1	2	2	1	1							2		1	
CO4	1	1	2	1	2			1			2	2		2	1
CO5	2	2	2		2			1			1	2	2	2	
CO6		1	1		2							1		1	1

UNIT-I

Introduction To Java – Introduction to OOP, OOP Concepts, History of Java, Java buzzwords, How Java differs from C , Structure of Java Program, data types, variables, constants, type conversion and casting, enumerated types, scope and life time of variables, operators, expressions , control flow- conditional statements, break and continue, simple java program, arrays, parameter passing, static fields and methods, access control, this, overloading methods and constructors, recursion, garbage collection.

UNIT-II

Inheritance –Inheritance concept, Super and Sub classes, Member access rules, types of Inheritance, super uses,final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.

UNIT-III

Interfaces – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Packages- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-IV

Files – streams, text Input/output, binary input/output, random access file operations, File management using File class, Using java.io.

Strings: Strings, string functions.

UNIT-V

Exception handling – benefits of exception handling, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exceptions. **Multithreading -** Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemonthreads, thread deadlock.

UNIT-VI

Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

TEXT BOOKS:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson eduction.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley &sons.
2. Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition.
3. An Introduction to OOP, second edition, T. Budd, pearson education.
4. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.
5. An introduction to Java programming and object oriented application development, R.A. Johnson-Thomson.
6. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, PearsonEducation.
7. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, PearsonEducation.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV B.Tech, I-Sem (ECE)

L	T	C
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(A0507203) DATABASE MANAGEMENT SYSTEMS

(Open Elective-III)

For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Advantages applications of DBMS and Database system structure.
- Schema design: ER model and conceptual design.
- Relational Model, Formal Query Languages and SQL basis.
- Storage and efficient retrieval of data: various indexing techniques.
- Schema refinement: normalization and redundancy removal and functional dependant.
- Transaction management: locking protocols, serializability concepts etc.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Students will learn about the need for DBMS, applications and its structure.
- Students will learn about storage and efficient retrieval of large Information, constraints and formal query languages.
- Students will also learn basics of SQL, primary key, foreign key concepts and triggers.
- Students will learn about functional dependency and the need for schema refinement (normalization) to remove redundancy of data.
- Students will also learn about transaction management concurrency Control.
- Students will learn about various storage and indexing methods and RAID concepts.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		3										2		
CO2	1			3				2						2	3
CO3		2								1	1		1		
CO4							2								2
CO5			2				2							1	

UNIT-1

Database System Applications, database System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Database Languages – DDL – DML – Database Access for applications Programs – Database Users and Administrator – Transaction Management – Database System Structure – Storage Manager – the Query Processor- Data base design and ER diagrams – Beyond ER Design- Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with the ER Model.

UNIT-2

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical database Design – Introduction to Views – Destroying /altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra queries – Relational calculus – Tuple relational Calculus – Domain relational calculus.

UNIT-3

The Form of a Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries, Set – Comparison Operators – Aggregate Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT

– Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL, Triggers and Active Data bases.

UNIT-4

Schema refinement – Problems Caused by redundancy – Decompositions – Problems related to decomposition – Functional dependencies-reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT-5

Overview Of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of transactions-Lock Based Concurrency Control, Performance of Locking, Transaction Support in SQL.
Concurrency Control: 2PL, Serializability and recoverability, Introduction Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking.

UNIT-6

Data on External Storage – File Organizations and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – The Memory Hierarchy, RAID, Disk Space Management, Buffer Manager, Files of Records, Page Formats, record Formats.

TEXT BOOKS:

1) Data base Management Systems, Raghu Ramakrishna, Johannes Gehrke, TATA McGraw Hill 3rd Edition 2017
2) Data base System Concepts, Silberschatz, Korth, McGraw hill, 6 edition, 2013.

REFERENCES:

1) Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 11th Edition, 2016.
2) Fundamentals of Database Systems, ElmasriNavathe Pearson Education.
3) Introduction to Database Systems, C.J.Date Pearson Education.
4) https://www.oreilly.com/library/view/concepts-of-database/9789332537422/xhtml/bibliography.xhtml
5) https://en.wikipedia.org/wiki/Database
6) https://www.sanfoundry.com/best-reference-books-database-management-systems/

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IV B.Tech, I-Sem (ECE)

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(A0544207) REAL TIME OPERATING SYSTEMS

(Open Elective-III)

COURSE OBJECTIVES:

- To learn real time scheduling and schedule ability analysis
- To understand formal specification and verification of timing constraints and properties
- To enable students to design real time systems
- To development and implement new techniques to advance real time systems research

COURSE OUTCOMES: At the end of the course, the student will be able to:

- The basic knowledge on real time operating system used in the embedded real time systems.
- Study and analysis of various real time scheduling algorithms.
- The skill to learn basic shell programming in Linux and RT Linux.
- Ability to design real time embedded system.
- Knowledge on the design of fault tolerant embedded real time system.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2														
CO2	2		2										2		
CO3												1		1	3
CO4		2	3		1								1	2	1
CO5		2	2										1		2

UNIT I

REAL TIME OPERATING SYSTEMS CONCEPTS: Architecture of kernel, Tasks and Task scheduler, Task States, Context Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task Management Call Functions, Interrupt services routines, Semaphores, Mutex, Mailboxes, Message queues, Event register, Pipes, Signals, Timers, Memory management, Priority inversion problem, Priority Inheritance, Path Finder Problem Revisited.

UNIT II

HARD and SOFT REAL TIME SYSTEMS: Jobs and processors, release times, deadlines, and timing constraints. Hard and soft timing constraints. Hard real time systems, soft real time systems

REFERENCE MODEL OF REALTIME SYSTEMS: Processors and Resources, Temporal parameters of real time work load, Periodic task model, Precedence Constraint and data dependency, Precedence graph and Task graph.

UNIT III

REAL TIME SCHEDULING APPROACHES: Clock Driven, Weighted round robin, priority driven, dynamic vs static systems, effective release times and deadlines.

REAL TIME OPERATING SYSTEM: QNX Neutrino, VX works, Microc/osII, RT Linux

UNIT IV

INTRODUCTION TO LINUX: overview of unix/Linux, Features, Commands, File Manipulation Commands, Editors, Directory Commands, Input/Output redirection, Pipes and Filters, File Protection, Process Commands,
About the Shell.

UNIT V

REAL TIME APPLICATIONS: Digital control, Selection of sampling period, Multirate Systems, Example of software controlled systems, Timing characteristics, Complex control law computations, Kalman filter, High level controls, Control hierarchy, Guidance and control, Timing requirements, Real time command and Control, signal processing, Radar systems, Multimedia applications.

UNIT VI

FAULT TOLERANCE TECHNIQUES: Introduction, fault causes, Types, detection, Fault and error containment, Hardware, software and timing redundancy

TEXTBOOKS

1) Embedded Real Time Systems Blackbook, Dr.K.V.K.K.Prasad, 2005 edition, Dreamtech press.
2) Jane W.S.Liu, "Real Time Systems", Pearson education, 2007.
3) C.M.Krishna, KANGG. Shin" Real Time Systems", McGraw Hill, 1997.

REFERENCES

1) www.kernel.org.
2) Vxworks Programming Guide.

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IV B.Tech, I-Sem (ECE)

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(A0523205) ADVANCED COMPUTER ARCHITECTURE

(Open Elective-IV)

For branches: ECE & CSE

COURSE OBJECTIVES:

- A broad understanding of computer architecture.
- To the extent possible, an understanding of the current state-of-the-art in uni-processor computer architecture.
- Study how to use technology to build the best computer/processor.
- To know different levels of parallelism.
- Issues in interconnection of networks and cluster design.

COURSE OUTCOMES:

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

- Broad understanding of the design of computer systems, including modern architectures and alternatives.
- Understanding of the interaction amongst architecture, applications and technology.
- Understanding of a framework for evaluating design decisions in terms of application requirements and performance measurements.
- A historical perspective on computer system design.
- Develop applications for high performance computing systems.

MAPPING OF COs & POs:

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

UNIT -I

Fundamentals of computer design-Technology Trends, Cost, Measuring and reporting performance, Quantitative principles of computer design.

UNIT -II

Instruction set principle and examples-Classifying instruction set, Memory addressing, Addressing modes for signal processing, Operations in the instruction set, Instructions for control flow, encoding an instruction set, the role of the compiler.

UNIT –III

Instruction level parallelism-Over coming data hazards, Reducing branch costs, High performance instruction delivery, Hardware based speculation, Compiler techniques, Static branch prediction, H.W. vs S.W solutions, Limitations of ILP

UNIT –IV

Memory hierarchy design-Cache performance, Reducing cache miss penalty and miss rate, Virtual memory, Protection and examples of virtual memory.

UNIT –V

Multi processors and thread-level parallelism-symmetric shared memory architectures,

Distributed -shared memory architectures, Synchronization, Multi-threading.

UNIT –VI

Storage systems Types of Storage Devices, RAID, Errors and failures in real time systems, **Interconnection Networks-:** Interconnection network media, Practical issues for commercial interconnection of networks, Clusters, Designing a cluster.

TEXT BOOK:

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

REFERENCES:

1. "Computer Architecture and parallel Processing" Kai Hwang and A.Briggs International Edition McGraw-Hill.
2. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.

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IV B.Tech, I-Sem (ECE)

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(A0443207) NETWORK SECURITY AND CRYPTOGRAPHY

(Open Elective-IV)

COURSE OBJECTIVES:

- To study various aspects of Network Security Attacks, Services and Mechanisms.
- To understand the mathematical concepts of various Encryption, Authentication and Digital Signature Algorithms.
- To standby the design of different general purpose and application specific security Protocols and standards.
- To identify suitable methods for applying security features for network traffic

COURSE OUTCOMES: At the end of the course, the student will be able to:

- To have a fundamental understanding of the objectives of cryptography and network security become familiar with the cryptographic techniques
- To attain knowledge on Encryption techniques, Design Principles and Modes of operation.
- To understand Authentication functions and Hash Functions works.
- To examine the issues and structure of Authentication Service and Electronic Mail Security
- To provide familiarity in Intrusion detection and Firewall Design Principles.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1												1
CO2	1	3	2										2	1	
CO3	2	2	1											2	
CO4	1	2	3											1	
CO5	1	2	2											1	1

UNIT I

INTRODUCTION: Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security, Classical encryption techniques symmetric cipher model, substitution ciphers, transposition ciphers, Steganography, Modern Block ciphers, Modern Stream ciphers. Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, linear and differential cryptanalysis, block cipher modes of operations, AES, RC4

UNIT II

INTRODUCTION TO NUMBER THEORY : Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence, Algebraic Structures, GF(2n) Fields, Primes, Primarily Testing, Factorization, Chinese remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

PUBLICKEY CRYPTOGRAPHY: Principles of public key cryptography, RSA Algorithm, Diffie Hellman Key Exchange, EL Gamal cryptographic system, Elliptic Curve Arithmetic, Elliptic curve cryptography

UNIT III

CRYPTOGRAPHIC HASH FUNCTIONS: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)

MESSAGE AUTHENTICATION CODES: Message authentication Requirements, Message authentication functions, Requirements for Message authentication codes
DIGITAL SIGNATURES: RSA with SHA & DSS

UNIT IV

KEY MANAGEMENT AND DISTRIBUTION: Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using Asymmetric, Distribution of Public keys, X.509 Certificates, Public key Infrastructure.
USER AUTHENTICATION: Remote user Authentication Principles, Remote user Authentication using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric Encryption, Federated Identity Management

UNIT V

SECURITY AT THE TRANSPORT LAYER (SSL AND TLS): SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security, HTTPS, SSH.
SECURITY AT THE NETWORK LAYER (IPSEC): Two modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

UNIT VI

SYSTEM SECURITY: Description of the system, users, Trust and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection System(IDS), Firewalls.

TEXT BOOKS:

1. Cryptography and Network Security: Principals and Practice, William Stallings, Fifth Edition, Pearson Education.
2. Cryptography and Network Security, Behrouz A. Frouzan and Debdeep Mukhopadhyay, 2nd edition, Mc Graw Hill Education.

REFERENCES:

1. Cryptography and Network Security, William Stallings, PHI, New Delhi, 2nd Edition, 1999
2. Cryptography and Security, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, WileyIndia.

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IV B.Tech, I-Sem (ECE)

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(A0540206) INTERNET OF THINGS (IoT)

(Open Elective-IV)

For branches: ECE & CSE

COURSE OBJECTIVES:

- To study the fundamentals about IoT
- To study about IoT Access technologies
- To study the design methodology and different IoT hardware platforms.
- To study the basics of IoT Data Analytics and supporting services.
- To study about various IoT case studies and industrial applications.

COURSE OUTCOMES:

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

- Understand the use of Devices, Gateways and Data Management in IoT
- Analyze various protocols for IoT
- Familiarize various IoT Development frameworks
- Develop and understand various applications in IoT
- Understand the need of Security and Vulnerabilities in IoT

MAPPING OF COs & POs:

	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	1	2	-	1	-	1	1	2	-	1
CO2	2	1	2	2	-	1	-	1	-	1	-	1	2	-	2
CO3	2	2	1	1	1	-	1	-	1	1	1	1	2	1	2
CO4	2	2	2	1	1	1	1	1	2	-	1	1	2	-	1
CO5	1	2	2	1	2	1	1	1	2	1	1	1	1	1	1

UNIT I

FUNDAMENTALS OF IoT: Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II

IoT PROTOCOLS: IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III

DESIGN AND DEVELOPMENT: Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT IV

DATA ANALYTICS AND SUPPORTING SERVICES: Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network

Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT V

INDUSTRIAL APPLICATIONS: Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

UNIT-VI

DEVELOPING IoT SOLUTIONS & VULNERABILITIES, ATTACKS AND COUNTERMEASURES IN IoT: Introduction to different IoT tools- Introduction to Arduino and Raspberry Pi- Implementation of IoT with Arduino and Raspberry - Primer on threats, vulnerability, and risks (TVR): The classic pillars of information assurance, Threats, Vulnerability and Risks. Primer on attacks and countermeasures: Common IoT attack types, Attack trees, Fault trees and CPS, Privacy and Security Issues in IoT.

TEXTBOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Russell Brian and Drew Van Duren, Practical Internet of Things Security, 1st Edition, Packt Publication, 2016.

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, Internet of Things - A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

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IV B.Tech, I-Sem (ECE)

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(A0516205) COMPUTER NETWORKS

(Open Elective-IV)

For branches: ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- An understanding of the overriding principles of computer networking, including protocol design, protocol layering, algorithm design, and performance evaluation.
- An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
- An understanding of specific implemented protocols covering the application layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack
- An understanding of security issues.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand the basis and structure of an abstract layered protocol models like OSI reference model and TCPIP reference model.
- Analyse and compare a number of data link, network, and transport layer protocols
- Analyse various related technical, administrative and social aspects of specific computer network protocols
- Analyse the features and operations of various application layer protocols such as Http, DNS, and SMTP and Have a basic knowledge of the use of cryptography and network security

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2												1	
CO2	1	2	3										2		2
CO3	2					3	2						2		1
CO4											2	3		2	

UNIT I

Introduction: Network Hardware, Network Software, References Models. The Physical Layer: Guided Transmission Media, Communication Satellites, The public Switched Telephone Network the Local Loop: Modern ADSL, and wireless, Trunks and Multiplexing, Switching.

UNIT II

The Data Link Layer: Data link Layer Design Issues, Elementary Data Link Protocols, and Sliding Window Protocols.

UNIT III

The Medium Access Control Sub layer: Multiple Access protocols, Ethernet Ethernet Cabling, Manchester Encoding, the Ethernet MAC Sub layer Protocol. The Binary Exponential Back off Algorithm, Ethernet Performance, Switched Ethernet, Fast Ethernet. Wireless LANs the 802.11 Protocol Stack, the 802.11 Physical Layer, The 802.11 MAC Sub Layer Protocol, The 802.11 Frame Structure.

UNIT IV

The Network Layer: Network Layer Design Issues, Routing Algorithms (Shortest path, Flooding, Distance Vector, Link state and Hierarchical routing, Broad cast routing, Multicast

routing), Congestion Control Algorithms, Internetworking, IPV4 Addresses.

UNIT V

The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP,

UNTI VI

The Application Layer: DNS The Domain Name System, Electronic Mail, The World Wide Web.

TEXT BOOKS:

1. Computer Networks, Andrew S. Tanenbaum, Fouth Edition, Pearson Education.
2. TCP/IP Protocol suite Fourth Edition Behrouz A.Forouzan

REFERENCES:

1. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, Cengage Learning.
2. Computer Networks, Bhushan Trivedi, Oxford.
3. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley India.
4. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
5. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning.
6. Computer and Communication Networks, Nader F. Mir, Pearson Education
7. Computer Networking: A TopDown Approach Featuring the Internet, James F.Kurose, K.W.Ross, Third Edition, Pearson Education.
8. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.

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IV B.Tech, I-Sem (ECE)

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(A0445207) MICRO WIND AND LAB VIEW

(Skill Development Course)

COURSE OBJECTIVES:

- To understand the Technology and features of microwind.
- To learn the simulation and performance estimations at circuit level
- To learn the basics of labview.

COURSE OUTCOMES: At the end of the course, the student will be able to:

- Understand the features and technology of micro wind
- Design and simulate the performance of various combinational and sequential circuits
- Understand the different parameter variations at the circuit level
- Understand the basics of the Labview software
- Learn the concepts of implementing a VI
- Understand the interfacing of simple VI's to DAQ

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1							1			2		1	
CO2	2	1													
CO3		2		2	2									2	
CO4	1	2							1			2		1	1
CO5	1		2		3								1		
CO6	1	2		2								2	1		

UNIT I

INTRODUCTION & FEATURES OF MICROWIND: Nanometer Era, Technology scaling, Micro wind design flow, DSCH, Nanoloamda, Virtuoso fab, Prothumbtransient analysis of voltage, current, transfer curve, eye diagram, parametric analysis, simulation on layout, Protutor, MEMsim, SOI, Design trends, Extractions, technology rule files.

UNIT II

SIMULATION AND PERFORMANCE ESTIMATIONS AT CIRCUIT LEVEL: Basic CMOS inverter simulation, layout, power, delay, area and metrics calculations, Simulations of basic gates and, or, xor, nand, 8 to 1 multiplexor, arithmetic circuits full adder, 4bit, 8bit, 16bit adders, comparator and sequential circuits – basic latch, RS latch, D latch at layout level.

UNIT III

STUDY OF DIFFERENT PARAMETER VARIATIONS AT CIRCUIT LEVEL: Study of variations of W/L ratio, threshold variations, Process, Voltage and temperature variations on the values of on current, off current, power dissipation, propagation delay and metrics of basic circuits.

UNIT IV

BASICS OF LABVIEW: Introduction, Components of LabVIEW, Owned and free labels, Tools and other pallets, Arranging Objects, PopUp menus, color coding, code debugging, and context help.

UNIT V

IMPLEMENTING A VI: Front panel design, LabVIEW data types, for loop, while loop, timing a VI, case structures, iterative data transfer.Relating Data Arrays, Clusters, type definitions.

UNIT VI

DATA ACQUISITION: Introduction, classification of signals, guidelines, practical Vs Ideal interfacing, Measurement and Automation explorer, Use of Simple VI's, Use of DAQmx.

TEXT BOOKS:

1. Microwind lab user manual.
2. Sanjay Gupta & Joseph John, Virtual Instrumentation Using LabVIEW, TMH, New Delhi.
3. Jovitha Jerome, Virtual Instrumentation Using LabVIEW, PHI, New Delhi.
4. Gary Johnson, Richard Jennings, LabVIEW graphical programming, McGraw Hill

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AUTONOMOUS
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV B.Tech, I-Sem (ECE)

L	T	C
2	0	2

(A0030207) PERSONNEL ETIQUETTE
(Humanities and Social Sciences)

COURSE OBJECTIVES:

- To help students to observe, experience, analyze individual behaviour and Group behaviour.
- To understand how individual, groups and structure have impacts on the effectiveness and efficiency.
- Students will learn on how to motivate with theories of motivation.
- To learn and appreciate different cultures, diversity and to cope up with stress.

COURSE OUTCOMES:

- Students will be able to identify the components of Individual Behaviour and apply the concept of Learning, Perception, Attitudes and values.
- Students will understand the role of individual, groups and structure in achieving goals effectively and efficiently.
- The student will be able to distinguish between the various theories of motivation and able to apply these theories to practical problems.
- Students try to accept and embrace with different people from different cultural and diverse background.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				3											3	
CO2										2	3	2				
CO3										3						
CO4				2									3			2

UNIT – I
Individual Behavior - Personality – Types – Theories - Factors influencing personality – Theories Attitudes – Characteristics – Components - Values. Perceptions – Importance – Factors influencing perception.

UNIT – II
Interpersonal skills - Communication Skills - Listening Skills – Assertiveness - Decision Making - Problem Solving - Verbal Communication - Non-Verbal Communication - Emotions and Moods in workplace.

UNIT – III
Group dynamics – Group Behavior - Group Formation – Groups in organizations – Interpersonal relations – Group decision making techniques - Group decision making vs. Individual decision making - dynamics of informal groups – dysfunctions of groups and teams.

UNIT – IV
Motivation – Importance – need - types and its effects on work behavior - Motivation Theories: Maslow's, Herzberg Theory – carrot and stick approach - McClelland's Theory of Needs -Vroom's Theory of Expectancy - McGregor's Theory X and Theory Y - Alderfer's ERG Theory.

UNIT – V

Change, Conflict And Power - Forces of change - Planned change – Resistance to change – Approaches - Concept of conflict - Traditional view and interactionists view of conflict - Conflict process - strategies to cope with stress and conflict – Power and Politics - Influence of Power.

UNIT – VI

Stress Management - Meaning and types of stress – Difference between eustress and distress; Frustration, conflict and pressure - Consequences of stress; Physiological and psychological changes associated with the stress response - Stress intervention.

TEXT BOOKS:

1. Stephen P. Robbins, Organizational Behavior, Pearson Education, 15/e, 2013.
2. Subbarao, P, Management and Organizational Behavior, Himalaya Pushing House, 2010.
3. K. Aswathappa, Himalaya Publishing House, Edition: 2018.
4. Stephen P. Robbins, Timothy A.Judge, Neharika Vohra, Organizational Behavior, Pearson Publication, 18/e, 2018.

REFERENCES:

1. Murugesan, Principles of Management, Laxmi Publications, 1/e, 2017.
2. Paul Hersey and Ken Blanchard, Management and Organisational Behavior, PHI, 2009.
3. Keith Davis, Human Behaviour at |Work, Tata McGraw Hill, 2009.
4. S.S.Khanka, Organisational Behaviour, S.Chand, 4/e, 2006.

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(A0094207) COMPREHENSIVE VIVA-VOCE

There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

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L	T	C
0	0	3

(A0095207) INDUSTRIAL / RESEARCH INTERNSHIP

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo research / industry internship in III year, II-Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research / industry internship will be evaluated during 7^{th} semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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L	T	C
0	0	1

(A0096208) TECHNICAL SEMINAR

COURSE OBJECTIVES:

- To understand the basic concepts of technical and practical issues of course specialization
- To import a well-organized report writing skill of technical writing

COURSE OUTCOMES:

At the end of the Seminar the students are able to:

- Identify and compare technical and practical issues related to the area of course specialization
- Outline annotated bibliography of research demonstrating scholarly skills
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	2	2	1	2	2	2	1	2	2	2	1
CO2	1	2	-	2	-	2	1	1	2	1	1	2	2	2	-
CO3	1	2	-	-	-	1	1	2	2	2	1	2	1	2	-
CO4	1	2	1	2	-	1	1	1	2	1	1	1	1	1	2

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L	T	C
0	0	5

(A0097208) INTERNSHIP IN INDUSTRY

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo 6 months internship in IV year, II-Semester for a complete period of 06 months in a reputed industry/organization. The finalization of the summer internship industry/organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the industry internship will be evaluated during 8^{th} semester which carries 05 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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IV B.Tech, II-Sem (ECE)

L	T	C
0	0	6

(A0098208) PROJECT WORK

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2
CO5	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO6	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2

The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV year II semester. The external project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminars (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

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ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct *If the candidate:*	Punishment
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 onlyof 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 withthe 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 beenimpersonated, shall be cancelled in all the subjects of the examination (including practicals and projectwork) 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 additionalsheet, 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	Cancellation of the performance in that subject.

	language inthe answer paper or in letters to the Examiners or writes to the Examiner requesting him to award pass marks.	
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 amounts to use of unfair meansor misconduct or has the tendency to disrupt the orderly conduct of the examination.	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.
7.	Leaves the exam hall taking away answer script or intentionally tears of 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 The candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned inclause 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 examinationhall.	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 Principal or College Academic committee for furtheraction to award suitable punishment.	