USHARAMA
COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS

(Approved by A.I.C.T.E & Permanently Affiliated to JNTU, Kakinada)
Accredited by NAAC with "A"Grade
on NH 16, Telaprolu, Krishna Dist – 521109

B.TECH
ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE
&
I, II , III, IV B.Tech SYLLABUS

UR20

(Applicable for the batches admitted from the Academic Year 2020-21)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision, Mission and Program Educational Objectives

Vision of the Institution:

To emerge as a centre of excellence in technical education by imparting quality teaching learning practices and research for the transformation of society.

Mission of the Institution:

- M1: Provide an ideal and the best class infrastructure to foster exploration in engineering and research.
- M2: Build dedicated faculty with student centric teaching, incorporating experiential, innovative skills.
- M3: Encourage life-long learning, entrepreneurial thinking, and ethical responsibility in students to address societal challenges.

Vision of the Department:

To be a pioneer in Electronics and Communication Engineering and research, promoting entrepreneurship and delivering innovative solutions to societal needs.

Mission of the Department:

- M1: To provide a strong foundation in Electronics and Communication Engineering, preparing students to tackle emerging technological challenges.
- M2: To drive research in Electronics and Communication Engineering that delivers innovative solutions to societal needs.
- M3: To promote lifelong learning, empowering students to adapt to the evolving technological advancements.

Program Educational Objectives:

- **PEO1** Exhibit continuous growth in technical expertise and leadership within the engineering field, while upholding professional ethics.
- **PEO2** Communicate effectively and manage resources skillfully as members and leaders of the profession.
- **PEO3** Commit to continuous learning and adapt to emerging technologies to meet the evolving needs of society.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

PROGRAM OUTCOMES (PO's)

Po. No	PROGRAM OUTCOME
PO-1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems..
PO-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.
PO-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.
PO-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.
PO-5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO-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.
PO-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.
PO-8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO-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.
PO-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.
PO-12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO-1	Develop electronics and communication systems in VLSI, embedded systems, signal processing, and RF communications using advanced tools.
PSO-2	Apply ECE knowledge to design, develop, and test systems, considering societal, environmental, ethical, and economic factors.

UR20 CBCS REGULATIONS

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1. PREAMBLE

Usha Rama College of Engineering and Technology (URCET) aims at achieving academic excellence by implementing new initiatives in teaching-learning and evaluation processes. Based on the directions of the University Grants Commission (UGC), New Delhi, All India Council for Technical Education (AICTE), New Delhi and Jawaharlal Nehru Technological University (JNTUK) Kakinada, URCET introduced the Credit Based Semester System (CBSS) in under-graduate programmes offered from the academic year 2019 – 20. Keeping in view of the standardization of the higher education system in India, URCET is going to implement Choice Based Credit System (CBCS).

2. ADMISSION CRITERIA

The eligibility criteria for admission into engineering programmes offered at URCET shall be as prescribed by the Government of Andhra Pradesh. The criteria are given below:

- The candidate shall be an Indian National / NRI.
- The candidate should have completed 18 years of age as on 31st December of the academic year for which the admissions are being conducted.
- The candidate should have passed the qualifying examination (10+2) or equivalent as on the date of admission recognized by BIE, Andhra Pradesh State.
- Seats in each programme in the Institute are classified into three categories i.e., Category – A, Category – B
- Category – Lateral Entry seats as per the GOs.

2.1 Category – A Seats

These seats shall be filled through counseling by convener as per the rank secured by a candidate in the Common Entrance Test (EAMCET) conducted by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

2.2 Category – B Seats

These seats shall be filled by the Institute as per the GOs issued by the Government of Andhra Pradesh from time to time.

2.3 Category – Lateral Entry seats

Direct Admission to Second Year: (Lateral Entry Scheme)

A candidate shall be admitted into the third semester (II year I semester) based on the rank secured by the candidate in the Engineering Common Entrance Test [ECET (For Diploma Holders)] by the Government of Andhra Pradesh and as per other admission criteria laid down in the GOs.

3. UNDER-GRADUATE DEGREE PROGRAMMES OFFERED

The following courses of study are offered at present as specializations for the B. Tech. Courses:

Table 1: Under graduate degree programs offered

S.No	Branch
1	Civil Engineering (CE)
2	Electrical and Electronics Engineering (EEE)
3	Mechanical Engineering (ME)
4	Electronics and Communication Engineering (ECE)
5	Computer Science and Engineering (CSE)
6	Information Technology (IT)

4. AWARD OF B.TECH DEGREE

A student will be declared eligible for the award of B. Tech. Degree if he/she fulfills the following academic requirements:

1. A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years
2. The candidate shall register for 160 credits and secure all the 160 credits.
   NOTE: 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. programme.
3. In case of Lateral Entry students, the candidate shall register for 120 credits and secure all the 120 credits.
   NOTE: Students, who fail to fulfill all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech. programme.

5. DURATION OF THE ACADEMIC PROGRAMMES

Under CBCS, it is possible for an outstanding student to qualify for the award of degree in a shorter time than that of the duration specified for the concerned programme. However, the B.Tech. degree shall be issued at the end of normal duration of the programme.

Normal Duration:

The duration of the B.Tech. degree programme shall be four (4) years. The duration of the B.Tech Lateral Entry Scheme (LES) degree programme shall be three (3) years.

Maximum Duration:

The maximum period in which a student can complete a full time B.Tech. degree programme shall be twice the normal duration of the programme, i.e., eight years (16 semesters) for B.Tech. degree and six years (12 semesters) for B.Tech. lateral entry scheme degree (For Diploma Holders).

The maximum period for a programme shall also be dictated by the fact that a student has to demonstrate the prescribed minimum academic performance by registering for the prescribed minimum number of credits in every semester, for continuing in the programme. This period can be equal to or lesser than the maximum period.

6. B.TECH. PROGRAMME COURSE STRUCTURE

6.1 Medium of Instruction And Examination

The medium of instruction shall be English for all the courses including their content delivery and examinations, seminars, presentations and project evaluation as prescribed in the programme curriculum.

6.2 Scheme of Instruction And Examination:

The scheme of instruction and examination of all B. Tech programs are given separately.

6.3 Minimum Instruction Days

Each semester shall consist of 16 weeks of academic work excluding examination and evaluation. The minimum instruction days for each semester shall be 90 working days.

7. COURSES AND CREDIT STRUCTURE

Table 2: Course Code and Definitions

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HMC	Humanities and social sciences including Management Courses
PCC	Professinal Core Courses
PEC	Professinal Elective Courses
OEC	Open Elective Courses
LC	Laboratory Courses
MC	Mandatory Courses
PROJ	Project

Table 3: Description of Courses

Broad Course Classification	Course Category	Description of Courses
Foundation Courses	Basic Science courses	Includes mathematics, physics, chemistry and biology courses
	Engineering Science courses	Includes fundamental engineering courses
	Humanities and Social Science courses including Management courses	Includes courses related to humanities, social sciences and management
Core courses	Professional Core courses	Includes core courses related to the parent discipline / department / branch of Engineering
	Project Work	B.Tech. project stage-I and stage-II
	Mini- project	Internship / Industry oriented mini-project
Elective courses	Professional Elective courses	Includes elective courses related to the parent discipline / department t/ branch of Engineering
	Open Elective courses	Elective courses which include inter – disciplinary courses or courses in an area outside the parent discipline / department / branch of Engineering
Mandatory courses		Mandatory non-credit courses

Table 4: Category of Courses, their Codes and Distribution of Credits

Type of Courses		Course Category	Code	Range of Credits
Compulsory Courses	Foundation courses	Engineering Science courses	ESC	14-20
		Basic Science courses	BSC	17-25
		Humanities & Social Science Incl. Management	HM	09-16
	Core courses	Professional Core courses	PC	70-75
	Project	Project	PROJ	12-13
Elective Courses		Professional Elective	PE	15-20
		Open Elective	OE	09-12
Mandatory Courses		Mandatory courses MC		Non- Credit
Total Credits				160

Engineering Exploration Project

Engineering Exploration Project is offered to the First year students of all engineering disciplines. The motivation of including this project is to make the students practice creative problem solving method - Design Thinking which fosters collaboration and solve problems in human-centered ways. It enables the students to exercise and identify design opportunities through various phases with the help of hands-on activities. Obtaining a best solution for an identified problem involves a non-linear, iterative process which seeks to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test. The students are encouraged to explore real-world problems and expected to take charge of their own learning, work together in teams towards the problem.

The evaluation of the Engineering Exploration Project involves in writing their observations in Activity Cards at the end of each task given in syllabus and submitting a final report along with working prototype.

8. CHOICE BASED CREDIT SYSTEM

Flexibility is extended to the fast learning students to take the courses of higher semesters in advance as per their convenience to concentrate on their placement activity/ project work etc., during the seventh/eighth semesters.

8.1 CBCS Course Registration policy

Fast learning students can register for additional courses from higher semesters by satisfying the pre-requisite course(s) to a maximum of 6 credits in each of the semesters from 3rd semester onwards along with the regular semester courses as prescribed. There is no minimum limit on the credits for taking additional courses.

8.2 Eligibility for choosing CBCS flexibility

Regular Students (4 Year duration), entering the nth semester must pass all the subjects in single attempt as on date and with CGPA ≥ 7.75 up to (n-2)th semester, are only eligible to opt for this flexibility.

Lateral entry students (3 year duration) with 70% Marks in their Diploma are eligible to opt for this flexibility during 3rd and 4th Semesters. Those students entering into V/ VI /VII semester with no backlog courses as on date and with CGPA ≥ 7.75 up to (n-2)th semester, are only eligible to opt for this flexibility

- List of additional courses offered in the even & odd semesters, registration dates will be notified by the respective departments well in advance.
- Withdrawal from the respective course by the student may be permitted within 10 days after the commencement of the course.
- Choice of opting this flexibility is purely optional to the students.
- Minimum number of students required to register for an additional course shall be twenty (20). In case the registered strength for the additional course is less than twenty (20), the course may be

offered on the recommendation of the Head of the Department and subsequent approval of the Principal.

9. EXAMINATIONS AND SCHEME OF EVALUATION

9.1 Description of Evaluation

9.1.1 Internal Evaluation

The performance of the student in each course is evaluated by the faculty/course coordinator all through the semester with mid-term examinations, assignments, Online quiz, project reviews, viva voce, laboratory assessment and other means covering the entire syllabus of the course.

9.1.2 Semester End Evaluation (SEE)

Semester End Examination (SEE) shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners. Question papers may be moderated for the coverage of syllabus, pattern of questions by an examiner appointed by the COE. The appointed examiner shall prepare a detailed answer key and scheme of valuation and submit it to the COE. Laboratory SEE shall be conducted involving internal and external examiners. The controller of examinations must use the panel of examiners for question paper setting/evaluation approved by concerned BOS. At present, Question paper setting and evaluation shall be external (IIT/NIT/Central University/State University/Reputed Autonomous Colleges).

9.2 CONTINUOUS INTERNAL EVALUATION

9.2.1 Theory Courses

Each course is evaluated for 30 marks. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term exam consists of one objective paper, one descriptive paper and one assignment. The midterm marks shall be awarded giving a weightage of 75% in the midterm examination in which the student scores more marks and 25% for the midterm examination in which the student scores less marks.

(a) Two assignment tests each for 5 marks will be conducted for 60 minutes duration. Question bank with minimum six comprehensive questions from the concerned UNIT of the syllabus will be given at least a week in advance before the commencement of Assignment Test.

(b) Two descriptive type mid-term examinations each for 15 Marks will be conducted for 90 minutes duration.

(c) Two Online Quizzes (Objective type mid-term exam) for 10 marks will be conducted for 20 minutes duration.

(d) For the subject having design and/or drawing (such as Engineering Graphics & Drafting, Machine Drawing) and

Estimation, there is no online quiz. The distribution of internal marks shall be as given below.
Day to day performance – 15M
Midterm exam – 15M

(e) **Mandatory Courses (Non Credit)**: Environmental Sciences, Universal Human Values, Ethics, Indian Constitution and Essence of Indian Traditional Knowledge etc are non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as Mandatory Course for all branches. There shall be Semester End Examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks. Internal marks can be calculated with 75% weightage for best performance internal exam and 25% weightage for least performance internal exam. Student has to secure 35% of marks in the Semester End Examination and minimum 40% marks in the sum total of the internal marks and Semester End Examination marks putting together for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified. A student who failed to complete the course can appear for a supplementary examination as per the schedule announced by URCET.

9.2.2 Lab Courses

For Laboratory courses there shall be continuous internal evaluation during the semester for 20 marks (Day to day work 10M + Record 5M + Internal laboratory test 5M) and semester end evaluation for 30 marks.

9.2.3 Engineering Exploration Project / Engineering Project for Community Services /Mini Project

For Engineering Exploration Project /Engineering Project for Community services / Mini Project, there shall be Internal evaluation during the semester for 20 marks and semester end evaluation for 30 marks.

9.2.4 Project: 80 Marks

Project work shall be carried out in two stages. The Project stage 1 during the VII semester and Project stage 2 during the VIII semester. Project stage 1 shall be evaluated for 50 marks and Project stage 2 shall be evaluated for 150 marks.

For Project stage 1, there shall be an internal evaluation during the VII semester for 20 marks and semester end evaluation for 30 marks. The internal evaluation for project stage 1 shall be on the basis of project reviews conducted by the Project Review Committee (PRC). The PRC consists of HOD, Project coordinator, two senior faculty members of the department and project guide. Students have to submit a report containing introduction

to the project work, literature survey and problem definition for the project stage 1 at the end of VII semester.

For Project stage 2, there shall be an internal evaluation during the VIII semester for 60 marks and semester end evaluation for 90 marks. The internal evaluation for Project stage 2 shall be on the basis of project reviews conducted by the Project Review Committee (PRC). Students have to submit a report containing the project work carried out during Project stage 1 and Project stage 2 putting together at the end of VIII semester.

9.3 SEMESTER END EXAMINATIONS

9.3.1 Theory Courses (70M)

The Semester End Examination shall be conducted for 3 hours duration at the end of the semester. The question paper shall be given in the prescribed pattern. Each course shall consist of 5 units of syllabus. The questions shall be framed in line with the Course Outcomes defined and Blooms Taxonomy levels.

9.3.2 Laboratory Courses

The semester end examination for laboratory courses shall be conducted for three hour duration at the end of semester for 30 marks. Each Semester-end Laboratory Examination shall be conducted by an External Examiner along with an Internal Examiner. The average of the marks awarded by Internal and External Examiners shall be taken into consideration in case of difference of opinion.

9.3.3 Engineering Exploration Project/ Engineering Project For Community Services/Mini Project: 30 Marks

The distribution of semester end examination marks for Engineering Exploration Project / Engineering Project for Community services and Mini Project is given below

Report – 20 Marks

Presentation and Viva Voce – 10 Marks

The semester end examination shall be conducted and evaluated by the Committee nominated by the Head of the Department.

9.3.4 Project: 120 Marks

The semester end examination for project stage 1 shall be held for 30 marks and project stage 2 shall be for 90 marks (Evaluation, Presentation and Viva Voce) by a committee consisting of an external examiner, Head of the Department and Project coordinator. The evaluation of project stage 1 shall be conducted at the end of VII semester and project stage 2 at the end of VIII semester. The average of marks awarded by the committee members shall be taken in to consideration. The semester end examination for both project stages shall be completed before the commencement of semester end theory examinations.

9.3.5 Self-Learning Courses:

(Prescribed from the existing open courseware)

Students who have qualified in the examination conducted by the MOOCs providers are exempted from appearing in the internal and semester end evaluations conducted by the institution in that category.

In case a student fails to complete the MOOCs course offered by MOOCs providers, he/she may be allowed to register again for the same with any of the providers from the list approved by the department.

For the courses under this category, those students who have not registered under MOOCs platform and are able to learn by themselves shall appear for internal evaluation for 20 marks and semester end examination for 30 marks in the VIII semester

The distribution of marks for internal evaluation is given below

Home assignment - 5M

Assignment test - 5M Midterm

Examination – 10M

9.3.6 Industry Interaction / Internships: 100M

Students have to register for an Internship in collaboration with an Industry of their specialization during summer.

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 100 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

9.3.7 Induction Program:

Induction program is mandatory for all the first year B.Tech students and shall be conducted as per Semester – 0 course structure.

9.4 MINIMUM ACADEMIC REQUIREMENTS

In addition to the attendance requirements mentioned in these regulations for the award of B.Tech Degree, a student must satisfy the minimum academic requirements as given below:

A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory or practical or design or drawing course in B.Tech programme, if he secures

9.4.1 A minimum of 35% marks for each theory course and Mandatory Course in the semester end examinations and a minimum of 40% marks for each theory course and Mandatory Course considering both IE and SEE taken together.

9.4.2 A minimum of 50% marks for lab courses, internship, industry oriented mini-project and project.

9.4.3 A student shall be treated as failed, if he does not submit a report on internship, industry oriented mini-project, project or does not make a presentation of the same before the evaluation committee as per the schedule, or secures less than 50% marks in evaluation.

9.4.4 In case of a student not meeting any of the above points, student may re-appear for each of the evaluation of internship, industry oriented mini-project, project, design sensitization, design thinking courses, as scheduled by the evaluation committee until he/she meets the requirement.

9.4.5 A student shall register for all the courses covering 160 credits as specified and listed in the course structure of the B.Tech programme, fulfills all the attendance and academic requirements for 160 credits, 'earn all 160 credits' by securing SGPA ≥5.0 (in each semester) and CGPA (at the end of each successive semester) ≥5.0 to successfully complete the under- graduate programme.

9.4.6 If a student fails to secure a pass grade in a particular course, he shall register and reappear for the supplementary examination in that course. It is mandatory that he should continue to register and reappear for the examination till he secures a pass grade.

9.4.7 A student eligible to appear in SEE of any course, but remains absent from it or gets failed (failing to secure 'D' grade or above) may reappear for that course in the supplementary SEE as and when conducted. In such cases, IE assessed earlier for that course shall be carried over, and added to the marks to be obtained in the supplementary SEE examination for evaluating the performance in that course.

9.4.8 A student detained in a semester due to shortage of attendance, may be re-admitted into the same semester in the next academic year for fulfillment of the academic requirements.

9.4.9 Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student. However, no grade allotments or SGPA/ CGPA calculations shall be done for the entire semester in which the student has been detained.

9.4.10 A student detained due to lack of credits, shall be promoted to the next year only after acquiring the required academic credits. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student.

9.4.11 The student shall be qualified in two certificate courses not less than 40 hours duration each during his course of study. Out of the two certificate courses, atleast one certificate course shall be pursued through MOOCs platform like SWAYAM-NPTEL online courses, Coursera online courses, BEC certification courses etc.

9.4.12 Students who fail to earn 160 credits(LEs 120 Credits) as indicated in the course structure within eight academic years(LEs 6) counting from the year of their admission shall forfeit their seat in B.Tech programme and their admission stands cancelled.

9.5 REVALUATION AND PERSONAL VERIFICATION

9.5.1 Internal Evaluation

The Internal Evaluation scripts shall be shown to the students before finalizing the marks.

9.5.2 Semester End Evaluation

1. As per the notification issued by the Controller of Examinations, the students can submit the application form along with the requisite fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with marks obtained.
2. The Controller of Examinations shall arrange for re-evaluation of those answer script(s).
3. A new examiner, other than the first examiner, shall re-evaluate the answer script(s).
4. Best out of the two will be taken into consideration.

9.5.3 Personal verification

On payment of special fee, the Semester End Examination answer scripts shall be shown to the candidate in front of the Controller of Examinations.

9.6 PERFORMANCE AND GRADING SYSTEM

Marks Range (% of marks)	Letter Grade	Level	Grade Points
≥ 90	O	Outstanding	10.00
≥80 to <90	S	Excellent	9.00
≥70 to <80	A	Very Good	8.00
≥60 to <70	B	Good	7.00
≥50 to <60	C	Fair	6.00
≥40 to <50	D	Satisfactory	5.00
<40	F	Fail	0
	AB	Absent	0

9.7 COMPUTATION OF SGPA AND CGPA

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

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

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

Computation of CGPA

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.

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

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Equivalent Percentage = (CGPA – 0.75) x 10

9.8 Award of Class

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

Class Awarded	CGPA to be secured	
First Class with Distinction	≥7.75 with no subject failures	From the CGPA secured from 160 Credits (120 credits incase of LEs)
First Class	≥ 6.75 with subject failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

9.9 WITH HOLDING RESULTS

If the student has any dues, to the institute or if any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

9.10 MALPRACTICES:

Institution implements JNTUK guide lines for malpractices and improper conduct in examinations.

Disciplinary Action for Malpractices/Improper Conduct in Examinations

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm	Expulsion from the examination hall and cancellation of the performance in that subject only.

	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)	
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is

		subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Controller of Examinations / Additional Controller of Examinations – 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	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.

	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 means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears 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 semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

		Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award suitable punishment.	

10. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

Student has to maintain a minimum of 50% in each subject and 75% of attendance in aggregate to be eligible for appearing the Semester End Examinations. Students who do not meet this requirement shall be detained in that semester.

However, the following are the special cases where the lack of attendance can be condoned.

(i) Shortage of attendance up to 10% on medical grounds in which case the student must submit the medical certificate from any recognized medical practitioner on the day of reporting back to the class work after recovery from ill health.

(ii) Up to a maximum of 10% if the student represents the university/state/country in any extra /co-curricular activities.

Shortage of attendance below 65 % shall in no case be condoned.

- A stipulated fee shall be payable towards condonation of shortage of attendance.
- Students, who do not meet the minimum required attendance in a semester, shall be detained in that semester and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester.
- Students detained in a semester shall seek re-admission into that semester as and when offered.
- Academic regulations applicable to the semester in which re-

admission is sought shall be applicable to the re-admitted student. In case if there are any professional electives and/or open electives, the same may also be re- registered if offered. However, if those electives are not offered in the later semesters, then alternate electives may be chosen from the same set of elective courses offered under that category.

- A student fulfilling the attendance requirement in the present semester shall not be eligible for re-admission into the same class.

11. ELIGIBILITY CRITERIA FOR SEMESTER END EXAMINATIONS

i) Minimum required attendance 75%
ii) No dues

12. PROMOTION RULES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.8 for promotion to higher classes

a. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per norms of the college.

b. A student will be promoted from II to III year if he fulfills the minimum attendance requirements in II year II semester and also the academic requirement of 40% of credits up to II year II Semester from all the examinations, whether or not the candidate takes the examinations. Due to any reason, if II Year II Semester results are not declared/delayed, student must have secured 40% of total credits up to II Year I semester of the respective programme from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

c. A student shall be promoted from III year to IV year if he fulfills the minimum attendance requirements in III year II semester as per the norms of the college and also the academic requirements of 40% of the credits up to III year II semester from all the examinations, whether or not the candidate takes the examinations. Due to any reason, if III Year II Semester results are not declared/delayed, student must have secured 40% of total credits up to III Year I semester of the respective programme from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

13. DISCIPLINE

Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.

13.1 Ragging:

As per the order of Honorable Supreme Court of India, ragging in any form is considered as criminal offence and is banned. Any form of ragging will be severely dealt with the institute implements anti ragging regulations of UGC.

URCET - ANTI RAGGING REGULATIONS

According to UGC Anti Ragging Regulations 2009

UGC REGULATIONS ON CURBING THE MENACE OF RAGGING IN HIGHER EDUCATIONAL INSTITUTIONS, 2009

In exercise of the powers conferred by clause (g) of Sub-Section (1) of Section 26 of the University Grants Commission Act, 1956, the University Grants Commission, hereby, makes the following Regulations, namely

Title, commencement and applicability:-

1. These regulations shall be called the "UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009".
2. They shall come into force with immediate effect.
3. They shall apply to all the Universities established or incorporated by or under a Central Act, a Provincial Act or a State Act, to all Institutions deemed to be University under Section 3 of UGC Act, 1956, to all other higher Educational Institutions, Including the departments, constituent units and all the premises (academic, residential, sports, canteen, etc.) of such Universities, deemed University and other Higher Educational Institutions, whether located within the campus or outside, and to all means of transportation of students whether public or private.

Objective:

To root out raging in all its forms from Universities, Colleges and other educational institutions in the country by prohibiting it by law, preventing its occurrence by following the provision of these regulations and punishing those who indulge in ragging as provided for in these regulations and the appropriate law in force.

"Ragging" means the following:

Any conduct whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness any other student, indulging in rowdy or undisciplined activities which causes or is likely to cause annoyance, hardship or psychological harm or to raise rear or apprehension thereof in a fresher or a junior student or asking the students to do any act or perform something which such student will not in the ordinary course and which has the effect of causing or generating a

sense of shame or embarrassment so as to adversely affect the physique or psyche of a fresher or a junior student.

Punishable ingredients or Ragging:

- Abetment to ragging;
- Criminal conspiracy to ragging;
- Unlawful assembly and rioting while ragging;
- Public nuisance created during ragging;
- Violation of decency and morals through ragging;
- Injury to body, causing hurt or grievous hurt;
- Wrongful restraint;
- Wrongful confinement;
- Use of criminal force;
- Assault as well as sexual offences or unnatural offences;
- Extortion;
- Criminal trespass;
- Offences against property;
- Criminal intimidation;
- Attempts to commit any or all of the above mentioned offences against the victim(s);
- Physical or psychological humiliation;
- All other offences following from the definition of "Ragging".

Punishments:

At the institution level:

Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:

- Suspension from attending classes and academic privileges.
- Withholding/Withdrawing scholarship/fellowship and other benefits.
- Debarring from appearing in any test/examination or other evaluation process.
- Withholding results.
- Debarring from representing the institution in any regional, National or International meet, tournament, Youth festival, etc.
- Suspension/ Expulsion from the hostel.
- Cancellation of Admission.
- Rustication from the Institution for period ranging from 1 to 4 semesters.
- Expulsion from the Institution and consequent debarring from admission to any other institution for specified period.
- Fine ranging between Rupees 25,000/- and Rupees 1 Lakh.

Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment.

13.2 Eve Teasing

i) Definition: "Eve teasing" means any indecent conduct or act by a man which causes or likely to cause intimidation, fear, shame or embarrassment to a woman, including abusing or causing hurt or nuisance to or assault, use of force on a woman.
ii) Eve teasing at any place is prohibited.
iii) Whoever commits or participates in or abets Eve teasing in or within the precincts of the institute shall be punished.

14. LATERAL ENTRY SCHEME ACADEMIC REGULATIONS

UR 20 CBCS regulations are applicable for lateral entry students admitted into 2nd year B.Tech from the Academic Year 2020-2021. All the regulations applicable to B.Tech 4-year degree course (Regular) will hold good for B.Tech Lateral Entry Scheme unless otherwise mentioned.

15. TRANSITORY REGULATIONS

1. Discontinued or detained candidates are eligible for readmission as and when next offered.
2. The readmitted students will be governed by the current regulations under which the candidate has been readmitted.
3. Transfer from other universities is permitted with the approval of Academic Council/APSHEC. Equivalent subjects and credits will be calculated with the approval of Board of Studies (BOS) chairman.

16. GENERAL

1. Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
2. The academic regulation should be read as a whole for the purpose of any interpretation.
3. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
4. 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.

17. AMENDMENTS TO REGULATIONS

The Academic council of Usha Rama College of Engineering and Technology (Autonomous) reserves the right to revise, amend or change the regulations, scheme of examinations and/or syllabi or any other matter pertained suitable to the needs of the students, society, industry without any notice.

COURSE STRUCTURE
ELECTRONICS AND COMMUNICATION ENGINEERING
(Applicable for batches admitted from 2020-2021)

I SEMESTER (I Year - I Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	ESC	UR20ES101	Problem Solving and Programming using C	3	0	0	3	3
2	BSC	UR20BS102	Applied Physics	3	0	0	3	3
3	ESC	UR20ES103	Basic Electrical Engineering	3	0	0	3	3
4	BSC	UR20BS104	Linear Algebra & Calculus	3	0	0	3	3
5	ESC	UR20ES114	Electronic Workshop	1	0	4	5	3
6	ESC	UR20ES111	Problem Solving and Programming using C Lab	0	0	3	3	1.5
7	BSC	UR20BS112	Applied Physics Lab	0	0	3	3	1.5
8	ESC	UR20ES113	Basic Electrical Engineering Lab	0	0	3	3	1.5
Total				**13**	**0**	**13**	**26**	**19.5**
***Breakup of credits for Engineering Graphics/Engineering Workshop shall be 1-0-4 (as per AICTE model curriculum)**								

II SEMESTER(I Year - II Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	ESC	UR20ES201	Python Programming	3	0	0	3	3
2	BSC	UR20BS202	Engineering Chemistry	3	0	0	3	3
3	HSC	UR20HS203	Communicative English	3	0	0	3	3
4	BSC	UR20BS204	Differential Equations & Vector Calculus	3	0	0	3	3
5	ESC	UR20ES205	Engineering Graphics & Drafting	1	0	4	5	3
6	ESC	UR20ES211	Python Programming Lab	0	0	3	3	1.5
7	BSC	UR20BS212	Engineering Chemistry Lab	0	0	3	3	1.5
8	HSC	UR20HS213	Communicative English Lab	0	0	3	3	1.5
Mandatory Courses								
9	MC	UR20MC200	Science, Technology & Society	0	0	0	2	0
10	MC	UR20MC201	Social Service Activity -I NCC/NSS/Social Service Club	0	0	0	0	0
Total				**15**	**0**	**13**	**28**	**19.5**

III SEMESTER(II Year - I Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	BSC	UR20BS301	Numerical Methods and Transforms	3	0	0	3	3
2	ESC	UR20ES302	Network Analysis	3	0	0	3	3
3	PCC	UR20PCEC303	Electronic Devices and Circuits	3	0	0	3	3
4	PCC	UR20PCEC304	Switching Theory and Logic Design	3	0	0	3	3
5	PCC	UR20PCEC305	Signals and Systems	3	0	0	3	3
6	PCC	UR20PCEC306	Random Variables and Stochastic Processes	3	0	0	3	3
7	PCC	UR20PCEC311	Electronic Devices and Circuits Lab	0	0	3	3	1.5
8	SOC	UR20SOEC312	Java Programming	1	0	2	3	2
Total				**19**	**0**	**5**	**24**	**21.5**
Mandatory Course								
9	MC	UR20MC300C	Environmental Science	0	0	0	3	0
10	MC	UR20MC300B	Social Service Activity - IINCC/NSS/Social Service Club	0	0	0	0	0

IV SEMESTER (II Year - II Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	ESC	UR20ES401B	Linear control Systems	3	0	0	3	3
2	HSC	UR20HS402C	Management Science	3	0	0	3	3
3	PCC	UR20PCEC403	Electronic Circuit Analysis	3	0	0	3	3
4	PCC	UR20PCEC404	Digital IC Design	3	0	0	3	3
5	PCC	UR20PCEC405	Analog Communications	3	0	0	3	3
6	PCC	UR20PCEC411	Electronic Circuit Analysis Lab	0	0	3	3	1.5
7	PCC	UR20PCEC412	Digital IC Design Lab	0	0	3	3	1.5
8	PCC	UR20PCEC413	Analog Communications Lab	0	0	3	3	1.5
9	SOC	UR20SOEC414	Soft Skills	0	0	4	4	2
10	PROJ	UR20PREC415	Community service Project	0	0	0	0	4
Total				**15**	**0**	**13**	**28**	**25.5**
Minor Course (The hours distribution can be 3-0-2 or 3-1-0 also)				**3**	**1**	**0**	**4**	**4**
Internship 2 Months (Mandatory) during summer vacation								

V SEMESTER(III Year - I Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	PCC	UR20PCEC501	Linear Integrated Circuits and Applications	3	0	0	3	3
2	PCC	UR20PCEC502	Electromagnetic Waves and Transmission Lines	3	0	0	3	3
3	PCC	UR20PCEC503	Digital Communications	3	0	0	3	3
4	PEC	**Professional Elective (PE1)**					3	3
		UR20PEEC504A	Antenna and Wave Propagation	3	0	0		
		UR20PEEC504B	Electronic Measurements and Instrumentation	3	0	0		
		UR20PEEC504C	Computer Architecture & Organization	3	0	0		
5	OEC	---	**Open Elective Course/Job oriented elective-1**	3	0	0	3	3
6	PCC	UR20PCEC511	Linear ICs and Applications Lab	0	0	3	3	1.5
7	PCC	UR20PCEC512	Digital Communications Lab	0	0	3	3	1.5
8	PROJ	UR20PREC513	Summer Internship	0	0	0	0	1.5
9	SOC	UR20SOEC514	Data Structures using Java Lab	0	0	4	4	2
			Total	**15**	**0**	**10**	**25**	**21.5**
Mandatory Course								
10	MC	UR20MC500A	Essence of Indian Traditional Knowledge	0	0	0	2	0
Minor Course (The hours distribution can be 3-0-2 or 3-1-0 also)				**3**	**1**	**0**	**4**	**4**

VI SEMESTER (III Year - II Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	PCC	UR20PCEC601	Microprocessor and Microcontrollers	3	0	0	3	3
2	PCC	UR20PCEC602	VLSI Design	3	0	0	3	3
3	PCC	UR20PCEC603	Digital Signal Processing	3	0	0	3	3
4	PEC	**Professional Elective (PE2)**		3	0	0	3	3
		UR20PEEC604A	Microwave Engineering					
		UR20PEEC604B	Internet of Things					
		UR20PEEC604C	Soft Computing Techniques					
5	OEC	---	**Open Elective Course/ Job oriented elective -2**	3	0	0	3	3
6	PCC	UR20PCEC611	Microprocessor and Microcontrollers - Lab	0	0	3	3	1.5
7	PCC	UR20PCEC612	VLSI Design Lab	0	0	3	3	1.5
8	PCC	UR20PCEC613	Digital Signal Processing Lab	0	0	3	3	1.5
9	SOC	UR20SOEC614	ARM based/Aurdino based Programming/IoT	1	0	2	3	2
			Total	**16**	**0**	**11**	**27**	**21.5**
Mandatory Course								
10	MC	UR20MC600C	Constitution of India	0	0	0	2	0
Minor Course (The hours distribution can be 3-0-2 or 3-1-0 also)				3	1	0	4	4
Industrial/Research Internship (Mandatory) 2 Months during summer vacation								

VII SEMESTER (IV Year - I Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	PEC	**Professional Elective (PE3)**		3	0	0	3	3
		UR20PEEC701A	Optical Communication					
		UR20PEEC701B	Digital Image Processing					
		UR20PEEC701C	Low Power VLSI Design					
2	PEC	**Professional Elective (PE4)**		3	0	0	3	3
		UR20PEEC702A	Satellite Communications					
		UR20PEEC702B	Embedded Systems					
		UR20PEEC702C	Digital IC Design using CMOS					
3	PEC	**Professional Elective (PE5)**		3	0	0	3	3
		UR20PEEC703A	Radar Engineering					
		UR20PEEC703B	Pattern Recognition & Machine Learning					
		UR20PEEC703C	Mobile & Cellular Communication					
4	OEC	---	**Open Elective Course/ Job oriented elective -3**	3	0	0	3	3
5	OEC	---	**Open Elective Course/ Job oriented elective -4**	3	0	0	3	3
6	HSC	UR20HS706	Universal Human Values-II: Understanding Harmony	3	0	0	3	3
7	SOC	UR20SOEC711	Designer Tools	1	0	2	3	2
8	PROJ	UR20PREC712	Industrial / Research Internship	0	0	0	0	3
Total				**19**	**0**	**2**	**21**	**23**
Mandatory Course								
9	MC	UR20MC700B	Research Methodology & IPR	0	0	0	2	0
Minor Course (The hours distribution can be 3-0-2 or 3-1-0 also				3	1	0	4	4

VIII SEMESTER (IV Year - II Semester)								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	PROJ	UR20PREC801	Project work, Seminar and internship in industry	-		-	-	8
INTERNSHIP (6 MONTHS)								
Total								**8**

Note:

i) **For MOOC Courses:** Based on the student's interest, student can register and complete a 12 week course one year advance, by prior information to the concern.

ii) **For courses with L-T-P-C:3-0-2-4/2-0-2-3**, the distribution shall be 30 marks for internal evaluation (15 marks for day–to–day work & lab internal exam and 15 marks for mid exam from theory part) and 70 marks for semester end examination. There shall be two mid exams in a semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two mids and 20% weightage for other mid and these are to be added to the marks obtained in day-to-day work & lab internal exam.

List of Open Electives Offered by the Institute

I. Open electives offered by CE Department for other branches (Except for CE branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OECE50A	Remote Sensing and GIS	3	0	0	3	3
2	OEC	UR20OECE50B	Environmental Pollution Control	3	0	0	3	3
3	OEC	UR20OECE50C	Conservation of Water Resources	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OECE60A	Environmental Engineering	3	0	0	3	3
2	OEC	UR20OECE60B	Disaster Management	3	0	0	3	3
3	OEC	UR20OECE60C	Green Technologies	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OECE70A	Safety Engineering	3	0	0	3	3
2	OEC	UR20OECE70B	Water Resources Engineering	3	0	0	3	3
3	OEC	UR20OECE70C	Elements of Civil Engineering	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OECE70A	Air Pollution Control Engineering	3	0	0	3	3
2	OEC	UR20OECE70B	Urban Planning	3	0	0	3	3
3	OEC	UR20OECE70C	Environmental Impact Assessment	3	0	0	3	3

II. Open electives offered by CSE Department for other branches (Except for CSE branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OECS505A	Data Structures	3	0	0	3	3
2	OEC	UR20OECS505B	Object Oriented Programming through JAVA	3	0	0	3	3
3	OEC	UR20OECS505C	Data Base Management Systems	3	0	0	3	3
4	OEC	UR20OECS505D	Computer Graphics	3	0	0	3	3
5	OEC	UR20OECS505E	Advanced UNIX Programming	3	0	0	3	3
6	OEC	UR20OECS505F	Computer Organization and Architecture	3	0	0	3	3
7	OEC	UR20OECS505G	Operating Systems	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OECS605A	Python Programming	3	0	0	3	3
2	OEC	UR20OECS605B	Web Technologies	3	0	0	3	3
3	OEC	UR20OECS605C	Soft Computing	3	0	0	3	3
4	OEC	UR20OECS605D	Distributed Computing	3	0	0	3	3
5	OEC	UR20OECS605E	AI and ML for Robotics	3	0	0	3	3
6	OEC	UR20OECS605F	Computer Networks	3	0	0	3	3
7	OEC	UR20OECS605G	Big Data Analytics	3	0	0	3	3
8	OEC	UR20OECS605H	Computational Tools	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OECS704A	AI Tools & Techniques	3	0	0	3	3
2	OEC	UR20OECS704B	Image Processing	3	0	0	3	3
3	OEC	UR20OECS704C	Information Security	3	0	0	3	3
4	OEC	UR20OECS704D	Mobile Application Development	3	0	0	3	3
5	OEC	UR20OECS704E	Data Science	3	0	0	3	3
6	OEC	UR20OECS704F	Cyber Security	3	0	0	3	3
7	OEC	UR20OECS704G	Introduction to Internet of Things	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OECS705A	MEAN Stack Technologies	3	0	0	3	3
2	OEC	UR20OECS705B	Deep Learning Techniques	3	0	0	3	3
3	OEC	UR20OECS705C	Cloud computing with AWS	3	0	0	3	3
4	OEC	UR20OECS705D	Block Chain Technologies	3	0	0	3	3
5	OEC	UR20OECS705E	Cryptography & Network Security	3	0	0	3	3
6	OEC	UR20OECS705F	Introduction to Machine Learning	3	0	0	3	3
7	OEC	UR20OECS705G	Machine Learning with Python	3	0	0	3	3

III. Open electives offered by ECE Department for other branches (Except for ECE branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OEEC505A	Basic Electronics	3	0	0	3	3
2	OEC	UR20OEEC505B	Basics of Signals and systems	3	0	0	3	3
3	OEC	UR20OEEC505C	Digital logic design	3	0	0	3	3
4	OEC	UR20OEEC505D	Consumer Electronics	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEEC605A	Electronic measurements and instrumentation	3	0	0	3	3
2	OEC	UR20OEEC605B	Principles of communications	3	0	0	3	3
3	OEC	UR20OEEC605C	Industrial Electronics	3	0	0	3	3
4	OEC	UR20OEEC605D	Fundamentals of Microprocessors and Microcontrollers	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEEC704A	IC Applications	3	0	0	3	3
2	OEC	UR20OEEC704B	Transducers and Sensors	3	0	0	3	3
3	OEC	UR20OEEC704C	Data Communications	3	0	0	3	3
4	OEC	UR20OEEC704D	Bio Medical Instrumentation	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEEC705A	IOT and applications	3	0	0	3	3
2	OEC	UR20OEEC705B	Remote Sensing and GIS	3	0	0	3	3
3	OEC	UR20OEEC705C	Soft computing Techniques	3	0	0	3	3
4	OEC	UR20OEEC705D	Principles of Signal Processing	3	0	0	3	3

IV. Open electives offered by EEE Department for other branches (Except for EEE branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
	OEC	UR20OEEE505A	Renewable Energy Sources	3	0	0	3	3
2	OEC	UR20OEEE505B	Concepts of Optimization Techniques	3	0	0	3	3
3	OEC	UR20OEEE505C	Concepts of Control Systems	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEEE605A	Battery Management Systems and Charging Stations	3	0	0	3	3
2	OEC	UR20OEEE605B	Fundamentals of utilization of Electrical Energy	3	0	0	3	3
3	OEC	UR20OEEE605C	Indian Electricity Act	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEEE704A	Concepts of Microprocessors and Microcontrollers	3	0	0	3	3
2	OEC	UR20OEEE704B	Fundamentals of Electric Vehicles	3	0	0	3	3
3	OEC	UR20OEEE704C	Concepts of Internet of Things	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEEE705A	Concepts of Power System Engineering	3	0	0	3	3
2	OEC	UR20OEEE705B	Concepts of Smart Grid Technologies	3	0	0	3	3

V. Open electives offered by IT Department for other branches (Except for IT branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OEIT505A	Full Stack Technologies	2	0	2	4	3
2	OEC	UR20OEIT505B	R-Programming	2	0	2	4	3
3	OEC	UR20OEIT505C	Scripting Languages	2	0	2	4	3
Open Elective-II								
1	OEC	UR20OEIT605A	Basics of AWS Framework	2	0	2	4	3
2	OEC	UR20OEIT605B	Mobile Application Development	2	0	2	4	3
3	OEC	UR20OEIT605C	NoSQL Databases	2	0	2	4	3
Open Elective-III								
1	OEC	UR20OEIT704A	Advanced python Programming	2	0	2	4	3
2	OEC	UR20OEIT704B	Deep Learning	2	0	2	4	3
3	OEC	UR20OEIT704C	Web Technologies	2	0	2	4	3
Open Elective-IV								
1	OEC	UR20OEIT705A	Network Programming	2	0	2	4	3
2	OEC	UR20OEIT705B	Big Data Technologies	2	0	2	4	3
3	OEC	UR20OEIT705C	Data Science	2	0	2	4	3

VI. Open electives offered by ME Department for other branches (Except for ME branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OEME505A	Robotics	3	0	0	3	3
2	OEC	UR20OEME505B	Fundamentals of Hybrid Vehicles	3	0	0	3	3
3	OEC	UR20OEME505C	Industrial Safety And Environment	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEME605A	Fundamentals of Operations Research	3	0	0	3	3
2	OEC	UR20OEME605B	Finite Element Analysis	3	0	0	3	3
3	OEC	UR20OEME605C	Principles of Nano Technology	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEME704A	Sustainable energy Technologies	3	0	0	3	3
2	OEC	UR20OEME704B	Optimization Techniques	3	0	0	3	3
3	OEC	UR20OEME704C	Advanced materials	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEME705A	Fundamentals of Mechatronics	3	0	0	3	3
2	OEC	UR20OEME705B	Industrial Engineering & Quality Control	3	0	0	3	3
3	OEC	UR20OEME705C	Rapid prototyping	3	0	0	3	3

List of subjects offered by ECE for Minor Degree								
S.No.	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**Contact Hrs./Wk**	**C**
1	MD	UR20MDEC01	Principles of Electronic Devices and Circuits	3	1	0	4	4
2	MD	UR20MDEC02A	Principles of Digital Electronics	3	1	0	4	4
		OR						
		UR20MDEC02B	Electronic measurements and instrumentation	3	1	0	4	4
3	MD	UR20MDEC03	Principles of Communication	3	1	0	4	4
4	MD	UR20MDEC04	Fundamentals of Signal and systems	3	1	0	4	4
5	MD	---	MOOC/NPTEL Course-1	-	-	-	-	2
6	MD	---	MOOC/NPTEL Course-2	-	-	-	-	2
			Total	**12**	**4**	**0**	**16**	**20**
MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each) are compulsory in the domain of Electronics and Communication Engineering								

CATEGORY AND CREDITS

S.No.	Course Category	Definitions	Suggested Breakup of Credits
1	BSC	Basic Science Courses	18
2	ESC	Engineering Science Courses	25.5
3	HMC	Humanities and social sciences including Management Courses	10.5
4	PCC	Professional Core Courses	52.5
5	PEC	Professional Elective Courses	15
6	OEC	Open Elective Courses	12
7	MC	Mandatory Courses	0
8	PROJ	Internship, Seminar, Project Work	16.5
9	SOC	Skill Oriented Courses	10
Total Credits			160

I Year –I Semester	COURSE CODE: UR20ES101	L	T	P	C
		3	0	0	3

Internal Marks: 30 Marks **External Marks: 70Marks**

PROBLEM SOLVING AND PROGRAMMING USING C

(Common to all branches)

Course Objectives:

- The objectives of this course are to make the student familiar with 'problem solving using computers, development of algorithms, usage of basic flowchart symbols and designing flowcharts.
- The students can also understand programming language basic concepts, reading and displaying the data, earn the programming skills using selection, iterative control structures, functions, arrays, pointers and files. After completion of this course the student is expected to analyze the real life problem and write programs in C language to solve the problems.

UNIT – I

INTRODUCTION

Problem Solving: Problem solving aspects, Problem solving techniques, Computer as a Problem solving tool, Algorithms-definition, features, criteria. Flowchart-definition, basic symbols, sample flowcharts. Top down design, Implementation of program verification, The efficiency of algorithms, Analysis of algorithms, computational complexity of algorithm, order(O) notation, Worst case & Average case Analysis.

UNIT – II

Basics of C programming language: Introduction to C, structure of a C program,.basic data types and sizes, constants, variables, unary, binary and ternary operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, Input and Output statements, Sample Programs.

SELECTION-DECISION MAKING CONDITIONAL CONTROL STRUCTURES: simple-if, if- else, nested if-else, if- else ladder and switch-case.

ITERATIVE: while-loop, do-while loop and for loop controlstructures, goto, break and continue statements. Sample Programs.

UNIT – III

FUNCTIONS -basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs :

ARRAYS -concepts, declaration, definition, accessing elements, storing 'elements, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays, array applications: Matrix operations, checking the symmetricity of a

Matrix, Passing 1-D arrays, 2-D arrays to functions, Strings and String Manipulations

UNIT – IV

POINTERS - pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address-dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and -multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT – V

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures-declaration, definition and initialization of structures, accessing 'structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications

FILEHANDLING: Concept of a file, text files and binary files, Formatted I/O, File I/O operations

TEXT BOOKS:

1. How to Solve it by Computer, R. G. Dromey, Pearson Education,2019
2. ProgramminginC,AshokNKamthane,AmitAshokKamthane,3rdEdition, PearsonEducation, 2019

REFERENCE BOOKS:

1. The C programming Language by Dennis Richie and BrianKernighan
2. Programming in C, Reema Thareja, OXFORD
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, Cengage

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1:Design efficient algorithm for solving a problem.

CO2:Identify various constructs of C programming language efficiently.

CO3:Apply programs using modular approach such as functions.

CO4:Create programs to perform matrix and mathematical applications.

CO5:Understand dynamic memory management and problems using pointers and solving the problems.

CO6:Develop real life applications using structures and also learn about handling the files for storing the data permanently.

*****

I Year - I Semester Course Code :UR20BS102

L	T	P	C
3	0	0	3

Internal: 30 Marks External: 70 Marks

APPLIED PHYSICS
(EEE/ECE)

Course Objectives:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
- Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings.

DIFFRACTION: Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – resolving power – Rayleigh's criterion.

UNIT-II

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

UNIT – III

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

UNIT – IV

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

UNIT – V

MAGNETISM: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para& Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

DIELECTRICS: Introduction - Dielectic polarization **–** Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

TEXT BOOKS:

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
2. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - DhanpatRai publishers, 2012.

Reference Books:

1. Applied Physics by P.K. Palanisamy, Scitech publications (2014).
2. Lasers and Non-Linear optics by B.B. Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014).
4. Physics for Engineers by M.R. Srinasan, New Age international publishers (2009).

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Explain the need of coherent sources and the conditions for sustained interference and analyze the differences between interference and diffraction with applications.

CO2: Understand the basic concepts of LASER light Sources, optical fibers and identify the Engineering applications of lasers & optical fibers in various fields.

CO3: Explain the concept of dual nature of matter to understand the significance of wave function and Interpret the concepts of classical and quantum free electron theories.

CO4: Classify the materials based on band theory and Apply the concept of effective mass of electron.

CO5: Classify the energy bands of semiconductors and their properties to identify the type of semiconductor using Hall effect.

CO6: Explain the concept of polarization in dielectric materials and summarize various types of polarization of dielectrics. Classification of magnetic materials based on susceptibility, temperature and explains the applications of dielectric and magnetic materials.

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I Year - I Semester	Course Code : UR20ES103B	L	T	P	C
		3	0	0	3

Internal: 30 Marks External: 70 Marks

BASIC ELECTRICAL ENGINEERING
(ECE)

Course Objectives:

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To understand the principle of operation and construction details of transformer.
4. To understand the principle of operation and construction details of alternator and 3-Phase induction motor.
5. To understand the principles and construction of various measuring instruments.

UNIT-I: D.C. CIRCUITS
Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems,

UNIT-II: A.C. CIRCUITS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations series, resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – III: GENERATION OF ELECTRIC POWER

Conventional Sources: Hydro power plant, Thermal power plant, Nuclear power plant.

Non-conventional Sources : Solar energy-Operating principle , Photovoltaic cell concepts, Cell, module, array , Series and parallel connections , Applications, Wind energy.

UNIT – IV: DC MACHINES

DC generator: Operation – emf equation – Magnetization characteristic of DC shunt generator.
DC Motor: Operation-types of DC motors-applications –speed control methods of DC shunt motor.

AC MACHINES

Principle of induction motor, Types of Rotors-Torque equation- Slip Torque Characteristics, simple problems, applications, synchronous generator- principle of operation.

UNIT – V

TRANSFORMERS

Operation of transformers – emf equation – losses – efficiency, OC and SC tests on transformers, auto transformer.

MEASUREMENTS

Working of measuring instruments Ammeter, Voltmeter, and Wattmeter.

Text Books

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.
3. Electric Circuits- A. Sudhakar & Shyam mohan S. Palli, Tata Mc-Graw-Hill,2005.
4. S,Rao,Prof.H.L.Saluja" Electrical safety and fire safety Engineering and safety management", Khanna publishers, New Delhi,1998.

Reference books:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition
4. Electrical Engineering – Prasad, Sivanagaraju, Cengage Learning

Course Outcomes:

Upon completion of the course, the student will be able to

CO1:Analyse the various electrical networks.
CO2:Understand the various conventional and Non conventional sources of energy.
CO3:Understand the operation of DC generator, DC Motor, 3-point starter and Speed control methods.
CO4:Analyse the performance of transformer.
CO5:Explain the operation of 3-phase alternator and 3-phase induction motors.
CO6:Understand measuring instruments.

*****

I Year - I Semester	Course Code :UR20BS104	L	T	P	C
		3	0	0	3

Internal: 30 Marks External: 70 Marks

LINEAR ALGEBRA & CALCULUS

(Common to all branches of engineering)

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

UNIT – I MATRICES

Solving system of homogeneous and non-homogeneous linear equations by Gauss elimination method. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

UNIT – II Sequences and Series

Convergence and divergence, Ratio test - Comparison test -Cauchy's root test-. Fourier series, Euler's formulae, conditions for Fourier expansion, Even and Odd functions.

UNIT – III Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (single variable & without proofs).

UNIT – IV Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – V Multiple Integrals

Double integrals, change of order of integration, double integration in Polar coordinates. Evaluation of triple integrals, change of variables.

TEXT BOOK:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig.
2. Mathematical Analysis, S.C.Malik and Savitha Arora.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1: Develop the use of matrix algebra techniques that is needed by engineers for practical Applications
CO2: Find or compute the Fourier series of Fourier series periodic signals.
CO3: Utilize mean value theorems to real life problems.
CO4: Transilate the given function as series of Taylor's and Maclaurin's with remainders.
CO5: Familiarize with functions of several variables which is useful in optimization.
CO6: Apply Double integration in evaluating areas bounded by regions.

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I Year - I Semester	COURSE CODE: UR20ES114B	L	T	P	C
		1	0	4	3

ELECTRONIC WORKSHOP
(ECE)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Study different Electronic Components.
2. To gain basic working knowledge on Laboratory Equipments.
3. To understand the computer hardware and practice the Assembly of computer parts.
4. To study commonly used CROs.
5. To practice the process of Installation of operating system windows.

Topics to be covered

I. Identification of components
II. Laboratory equipment
III. Soldering practice
IV. PCB Layout
V. Testing of Components
VI. CRO
VII. Introduction to EDA Tools
VIII. Interpret data sheets of discrete components and ICs.
IX. Familiarization with Computer Hardware & Operating System:
X. Familiarization with Office Tools

I. Identification of components:

- Resistors:- Types of Resistors, Value of Resistance using color code, DRBS.
- Capacitors:- Types of capacitors, value of capacitance using color code, DCBS.
- Inductors:- Types of Inductors, DLB
- Rheostats:- Types of Rheostats, Types of potentiometers, Relays.
- Switches:- Types of Switches.
- Cables: Types of Cables.
- Types of Instruments used.

Identification of active elements.
(Two Terminal, Three Terminal Devices)

- Semiconductor diode, Zener diode
- Three Terminal Devices: BJT, UJT, SCR, FET, MOSFET,TRIAC.
- Digital and Analog ICs. (TO and Flat packages) IC regulators types.
- Testing of above components using Multimeters.

II. Laboratory Equipment:

A) Meters:-

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

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

III. Soldering practice

Tools kit including soldering iron

Tools Kit:

- Insulated nose player
- Insulated
- Electrical tester
- Soldering iron, Lead, Flux

IV. PCB layout and Design.

Assembling and Testing of simple electronic circuits on breadboards; identifying the components and its location on the PCB, soldering of the components, testing the assembled circuit for correct functionality.

V. Testing of Components.

Active and Passive Components:

- Testing of electronic components like Resistor, Capacitor, Diode, Transistor, ICs etc.
- Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments

VI. CRO

- Find the Amplitude and Frequency of a signal
- Measure the Unknown Frequency & Phase difference of signals using Lissajous figures

VII. Introduction to EDA Tools

MULTISIM/PSPICE/TINA schematic capture tool, Learning of basic functions of creating a new project, getting and placing parts, connecting placed parts, simulating the schematic, plotting and analyzing the results.

VIII. Interpret data sheets of discrete components and IC's.

Write important specifications/ratings of components & ICs and submit it in the form of a report

IX. Familiarization with Computer Hardware & Operating System:

- Identify the internal parts of a computer, and its peripherals.
- Disassemble and assemble the PC back to working condition.
- Install Operating system on the computer. Students should record the entire installation process.

X. Familiarization with Office Tools

- Word Processor: Able to create documents using the word processor tool
- Spreadsheet: Able to create, open, save the application documents and format them as per the requirement.
- Presentations: creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

List of Experiments/Jobs:

1. Study of Basic Electronic Components.
2. Study of CRO, Function Generator, Multimeter, D.C. Power Supply.
3. Study of PCB and PCB layout.
4. Solder the electronic components.
5. Assembling a electronic circuit on PCB and testing it.
6. Test the electronic components like Resistor, Capacitor, Diode, Transistor, ICs.
7. Compare values of components like resistors, inductors, capacitors etc with the measured values by using electronic instruments.
8. Find the Amplitude and Frequency of a signal using CRO.
9. Measure the Unknown Frequency & Phase difference of signals using Lissajous figures using CRO.
10. Create a new project using EDA tools.
11. Simulation of a electronic circuit using EDA tools.
12. Plot and Analyze the Simulation of a electronic circuit using EDA tools.
13. Write important specifications/ratings of components & ICs and submit it in the form of a report.
14. Identify the internal parts of a computer, and its peripherals.
15. Disassemble and assemble the PC back to working condition.
16. Install Operating system on the computer. Students should record the entire installation process.
17. Create documents using the word processor tool.
18. Create Spreadsheet, open, save the application documents and Format them as per the requirement.
19. Create Power Point Presentations, saving and running the representations, Selecting the style for slides, formatting the slides with different fonts, colors.
20. Create Power Point Presentations, graphics and animations, bulleting and numbering, hyper-linking, running the slide show, setting the timing for slide show.

Note: Minimum 18 experiments/jobs of duration 4 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, student has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

Upon completion of the course, the student will be able to

CO1. Identify discrete components and ICs

CO2. Assemble simple electronic circuits over a PCB

CO3. Test various components

CO4. Interpret specifications (ratings) of the component

CO5. Demonstrate disassembling and assembling a Personal Computer and make the computer ready to use

CO6. Make use of Office tools for preparing documents, spread sheets and presentations

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I Year –I Semester **COURSE CODE: UR20ES111**

L	T	P	C
0	0	3	1.5

Internal Marks: 15 Marks **External Marks: 35Marks**

PROBLEM SOLVING AND PROGRAMMING USING C LAB

(Common to all branches)

Course Objectives:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Exercise 1

a) Write a C Program to calculate the area of a triangle.
b) Write a C program to find the largest of three numbers using ternary operator.
c) Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

a) Write a C program to find the 2's complement of a binary number.
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 3

a) Write a C program to find the sum of individual digits of a positive integer and, also, find 'the reverse of the given number.
b) Write a C program to generate the first n terms of the Fibonacci sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

a) Write a C Program to print the multiplication table of a given number.
b) Write a C Program to read a decimal number and find its equivalent binary number.
c) Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

a) Write a C program to interchange the largest and smallest numbers in the given array.
b) Write a C program to implement a liner search on a given set of values.
c) Write a C program to implement binary search on a given set of values.

Exercise 6

a) Write a C program to implement sorting of an array of elements.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

Exercise 7

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

i. To insert a sub-string into given main string at a given position.
ii. To delete n characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location.

Exercise 8

Write a C program that uses functions to perform the following operations using Structure: i) Reading a complex number
ii) Writing a complex number
iii) Addition of two complex numbers
iv) Multiplication of two complex numbers

Exercise 9

Write C Programs for the following string operations without using the built in functions

- to concatenate two strings to append a string to another string
- to compare two strings

Exercise 10

a) Write C Program to find the number of characters in a given string including and excluding spaces.
b) Write C Program to copy the contents of one string to another string without using string handling functions.
c) Write C Program to find whether a given string is palindrome or not.
d) Write a C program to find both the largest and smallest number of an array of integers using call by value and call by reference.

Exercise 11

Write a C program using recursion for the following:

a) To display sum of digits of given number
b) To find the factorial of a given integer
c) To find the GCD (greatest common divisor) of two given integers.
d) To find Fibonacci sequence

Exercise 12

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two 2D arrays using pointers
c) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

Exercise 13

Examples which explore the use of structures, union and other user defined variables.

Exercise 14

a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. Then names of the files must be entered using command line arguments.

Note: Minimum 12 experiments/ Exercises of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

CO1: Apply and practice logical ability to solve the problems.
CO2: Identify C programming development environment, compiling, debugging, and linking and executing a program using the development environment.
CO3: Analyze the complexity of problems, modularize the problems into small modules and then convert them into programs.
CO4: Apply the in-built functions and customized functions for solving the problems.
CO5: Create C programs using pointers, memory allocation techniques.
CO6: Use files for dealing with variety of problems.

*****

I Year - I Semester	Course Code :UR20BS112	L	T	P	C
		0	0	3	1.5

Internal: 15 Marks External: 35 Marks

APPLIED PHYSICS LAB
(EEE/ECE)

Course objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of electrical and optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of thickness of a spacer using wedge film and parallel interference fringes.
4. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5. Energy Band gap of a Semiconductor p - n junction.
6. Characteristics of Thermistor – Temperature Coefficients
7. Determination of dielectric constant by charging and discharging method
8. Determination of resistivity of semiconductor by Four probe method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
11. Dispersive power of diffraction grating.
12. Verification of laws of stretched string – Sonometer.
13. Resolving power of grating.
14. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall Effect.
15. Variation of dielectric constant with temperature.

Text book:

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

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

Upon the completion of the course, the student will be able to:

CO1: operate optical instruments like microscope and spectrometer.
CO2: interpret the thickness of a hair/paper with the concept of interference.
CO3: determine the wavelength and resolving power of different colors using diffraction grating.
CO4: make use of the elastic response of loaded beams; estimate the frequency of a vibrating system using standing wave pattern.
CO5: estimate the dielectric constant by charging and discharging method.
CO6: measurement of magnetic susceptibility by Quincke's method.

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I Year - I Semester	Course Code : UR20ES113B	L	T	P	C
		0	0	3	1.5
	Internal: 15 Marks	External: 35 Marks			

BASIC ELECTRICAL ENGINEERING LAB
(ECE)

Course Objectives:

1. To gain basic principle of ohm's law, KVL and KCL.
2. To determine linearity by superposition theorem.
3. To determine thevenin's equivalent circuits.
4. To determine cold and hot resistance of bulb.
5. To determine efficiency of DC shunt machine
6. To calculate losses of transformer

Minimum **six** experiments are to be conducted from each part

PART – A

1. Verification of ohm's law.
2. Verification of KVL and KCL.
3. Verification of Superposition theorems.
4. Thevenin's equivalent circuits and verification by direct test.
5. Measurements of cold and hot resistance.
6. Norton's theorem equivalent circuits and verification by direct test.
7. To study and measure the concept of earthing.

PART – B

1. Speed control of DC shunt motor.
2. Brake test on DC shunt motor.
3. OC tests on Single-phase transformer.
4. SC tests on Single-phase transformer.
5. Brake test on 3-phase Induction motor.
6. Magnetization characteristic of DC shunt generator.
7. Measurement of Active and reactive powers in a 3-ϕ balanced circuit

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

Upon the completion of the course, the student will be able to:

CO1:Understand the basic principle of ohm's law, KVL and KCL.

CO2:Understand superposition and thevenin's theorem.

CO3:Understand the efficiency of DC shunt machine.

CO4:Understand the calculation of losses in transformer.

CO5:Understand the characteristic of induction motor.

CO6:Understand the operation of amplifier and full wave rectifier.

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I Year –II Semester **COURSE CODE: UR20ES201** **L T P C**

3 0 0 3

Internal Marks: 30 **External Marks: 70**

PYTHON PROGRAMMING

(CSE/ECE/IT/EEE)

Course objectives:

- Introduction to Scripting Language.
- Exposure to various problems solving approaches of computer science.

UNIT – I:

Introduction: History of Python, Need of Python Programming, – Python Interpreter and its environment. Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

UNIT – II:

Data Structures: Lists, Tuples, Sets, Dictionaries, Sequences, Comprehensions.

UNIT – III:

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values),

Modules: Creating modules, import statement, from. Import statement, name spacing.

Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT – IV:

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding ,

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

UNIT – V:

Brief Tour of the Standard Library: Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics.

TEXT BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson

2. Learning Python, Mark Lutz, Orielly.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press

2. Core Python Programming, W.Chun, Pearson.

3. Introduction to Python, Kenneth A. Lambert, Cengage.

4. Mark Lutz ,"Programming Python ", O Reily, 4thEdition.

COURSE OUTCOMES:

Upon the completion of the course, the student will be able to:

CO1: Understand the history of python, need for python, types and operators of python.

CO2: Use python functions and arguments, students able to create modules.

CO3: Understand the concepts of lists, tuples, sets, dictionaries, sequences, comprehensions.

CO4: Use object oriented features of Python, student able to evaluate the errors and exceptions.

CO5: Understand the concepts of os interface, string pattern matching, data compression, Multi threading,

CO6: Understand the concepts of GUI programming, and turtle graphics.

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I Year : II Semester COURSE CODE: UR20BS202

L	T	P	C
3	0	0	3

Internal: 30 Marks External: 70 Marks

APPLIED CHEMISTRY
(ECE/EEE)

Course Objectives:

- Importance of usage of Plastics in household appliances and composites (FRP) in aerospace automotive industries.
- Select the fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- Construction of galvanic cells as well as some batteries used in instruments are introduced. Understand the mechanism of corrosion which itself is explained by electrochemical theory
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- Explain the computational chemistry and different applications of analytical instruments.

UNIT I: HIGH POLYMERS AND PLASTICS

Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) - Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4 techniques)- Preparation, properties and applications of Polyethene, PVC, Bakelite and Teflon Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers. Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal –– Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knocking agents – Power alcohol – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

UNIT III: ELECTROCHEMICAL CELLS AND CORROSION

Part-A:

ELECTROCHEMISTRY

Introduction- Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell –

Lead-Acid storage cells-Li cells. Fuel cells: - Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells.

Part-B

CORROSION

Corrosion:- Definition – Theories of Corrosion (electrochemical and chemical)- Galvanic corrosion,Differential aeration corrosion –Factors which influence the rate of corrosion - Protection from corrosion– Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating).

UNIT IV: CHEMISTRY OF ADVANCED ENGINEERING MATERIALS

Nano materials:- Introduction–Sol-gel method & chemical reduction method of preparation - Carbon nanotubes-Preparation and Applications; **Solar Energy:**- Introduction, application of solar energy, photovoltaic cell: design, working and its importance

Liquid Crystals :- Types and applications

Non-Elemental Semiconducting Materials:-Stoichiometric, Controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors (Distillation, Zone refining, ion implantation) **Superconductors** :- Type-I & Type-2, properties &applications.

UNIT-V: COMPUTATIONAL CHEMISTRY AND SPECTROSCOPIC STUDIES

COMPUTATIONAL CHEMISTRY: Introduction, Ab Initio studies.

SPECTROSCOPIC STUDIES: Electromagnetic spectrum-UV(laws of absorption, instrumentation, theory of electronic spectroscopy,Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), X-Ray diffraction method , FT-IR(Instrumentation and IR of some organic compounds(Benzene, Propane and Ethyl alcohol), Applications of FT-IR-MRI and CT scan(Procedure & Applications).

Text Books:

1. Engineering Chemistry by Jain and Jain; DhanpatRai Publicating Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by PrasanthRath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
4. Applied Chemistry by H.D. Gesser, Springer Publishers.
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM.

Course Outcomes:

Upon the completion of course, student will be able to

CO1: Uderstand the advantages and limitations of plastic materials. (L2)

CO2: Relate the need of fuels as a source of energy. (L2)

CO3: Explain the theory of construction of batteries (L3)

CO4: Categorize the reasons for corrosion and study some methods of corrosion control. (L4)

CO5: Know the importance of advanced engineering materials like Nanomaterials, Liquid crystals, Semiconductors and superconductors. (L5)

CO6: Obtain the knowledge of computational chemistry and understand the principles of different analytical instruments (L2)

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I Year - II Semester	Course Code : UR20HS203	L	T	P	C
		3	0	0	3

Internal: 30 Marks External:70 Marks

COMMUNICATIVE ENGLISH
(ECE/EEE)

Course Objectives:

- Recall and improve the language proficiency of the students in English
- Paraphrase and interpret the ideas and thoughts in a dynamic way
- Prioritize the importance of practical learning of English
- Distinguish the various levels of Listening, Speaking, Reading and writing skills
- Construct statements in writing and speaking in professional manner

UNIT – I
Poem: "Life" by Sarojini Naidu
Grammar: Articles
Vocabulary: Prefixes and Suffixes
Writing: Paragraph Writing
Life-Skills: Attitude

UNIT – II
Essay: A Drawer full of Happiness
Grammar: Prepositions
Vocabulary: Homonyms, Homophones, Homographs
Writing: Letter of Request and Apology
Life-Skills: Self- Management

UNIT – III
Short Story: "Half a Rupee Worth" by R.K. Narayan
Grammar: Tenses
Vocabulary: Idiomatic Expressions; Phrasal Verbs
Writing: Letter of Complaint and Appreciation
Life-Skills: Body Language

UNIT – IV
Text: Stephen Hawking – Positivity 'Benchmark'
Grammar: Question Tags, Conjunctions
Vocabulary: One - Word Substitutes, Collocations
Writing: Dialogue and Speech Writing
Life-Skills: Being Assertive

UNIT – V
Poem: Once Upon a Time by Gabriel Okara
Grammar: Degrees of Comparison
Vocabulary: Technical Abbreviations
Writing: E-mail Writing, Preparation of Resume and Letter of application
Life-Skills: Goal Setting, Working in a Team

TEXT BOOK:
'InfoTech English' – Maruti Publications

REFERENCE BOOKS:
1. Raymond Murphy, "Murphy's Essential English Grammar" with CD, Cambridge University Press
2. Practical English Usage, Michael Swan, OUP, 1995

NPTEL ONLINE COURSE:
'Enhancing Soft skills & Personality Development

Course Outcomes:
Upon the completion of course, student will be able to
CO1: Apply critical-thinking to develop writing skills
CO2: Understand and evaluate different kinds of prose tests.
CO3: Describe distinct literary characteristics of poems.
CO4: Analyze the major and minor details of a biography.
CO5: Develop grammar and vocabulary skills
CO6: Evaluate the effectiveness in improving life-skills.

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I Year -II Semester	Course Code :UR20BS204	L	T	P	C
		3	0	0	3

Internal: 30 Marks External: 70 Marks

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(Common to all branches of engineering)

Course Objectives:

- To enlighten the learners in the concept of differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT – I Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral with RHS of the forms e^ax, Sinax, Cosax, x^n, e^ax.V and xV. L-C-R Circuit problems.

UNIT – II First order Partial Differential Equations

Formation of PDE, solutions of Lagrane's linear equation Method of grouping – Method of multipliers, Solution of non-linear PDEs of the forms f(p,q)=0, f(z,p,q)=0, f(x,p)=g(y,q), Z=px+qy+f(p,q).

UNIT – III Applications of Partial Differential Equations

Method of Separation of variables-One dimensional Wave equation-Two dimensional Heat equation, Laplace equation.

UNIT – IV Vector Differential Calculus

Scalar and vector point functions, Gradient, Directional derivative. Divergence, Curl, Physical interpretation of operators.

UNIT – V Vector Integral Calculus

Line integral-work done, surface and volume integrals, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Divergence theorem (without proof).

TEXT BOOK:

1. Higher Engineering Mathematics, B. S. Grewal.

Reference Books:

1. Advance Engineering in Mathematics, Erwin Kreyszig.
2. Vector calculus, Schaum's series.

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Solve the differential equations related to various engineering fields.

CO2: Identify solution methods for partial differential equations that model physical processes.

CO3: Apply a range of techniques to find solutions of standard PDEs .

CO4: Classify the nature of the partial differential equations.

CO5: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO6: Estimate the work done against a field and circulation using vector calculus.

*****

I Year – II Semester	Course Code : UR20ES205	L	T	P	C
		1	0	4	3

Internal: 30 Marks External: 70Marks

ENGINEERING GRAPHICS & DRAFTING
(ECE/EEE)

PRE-REQUISITES: Mathematics, Physics

Course Objective:

- Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING:
Introduction: Principles of Engineering Graphics and their significance Drawing Instruments - Geometrical Constructions.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Ellipse ,Parabola and Hyperbola by general methods,
Scales: Diagonal scales and Vernier scales

UNIT – II

ORTHOGRAPHIC PROJECTIONS: Principle of orthographic projection-Method of Projections – First and third angle projection methods Projections of Points – Projections of straight lines of different orientations - True lengths and traces.

UNIT – III

PROJECTIONS OF PLANES & SOLIDS: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes. Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of theplanes.

UNIT – IV

ISOMETRIC VIEWS: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

UNIT – V

COMPUTER AIDED DRAFTING: Introduction – Computer Aided drafting system –Advantages, Applications of AUTOCAD, Drafting software-AUTOCAD-Advantages, Initial setup commands, utility commands, Drawing Aids, Entity Draw commands, Display commands, Edit commands, Lettering & Dimensioning

TEXT BOOKS:

1. N. D. Bhatt, Engineering Drawing, Revised and Enlarged Edition, Charotar publishers,
2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw HillPublishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, ScitechPublishers
2. Engineering Graphics for Degree by K.C. John, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHillPublishers

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Use the geometrical objects considering BIS standards.

CO2: Identify the basics of orthographic projections and deduce orthographic projections of a point and a line at different orientations.

CO3: Plan the visualization of geometrical planes of different positions in real life environment.

CO4: Sketch the projection of various of types of solids.

CO5: Prepare the orthographic views of various solid objects at different orientations.

CO6: Judge the significance of isometric drawing to relate 2D environment with 3D environment. Learn basics of CAD.

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I Year –II Semester **COURSE CODE: UR20ES211** **L T P C**

0 0 3 1.5

Internal Marks: 15 Marks **External Marks: 35 Marks**

PYTHON PROGRAMMING LAB
(CSE/ECE/IT/EEE)

Course Objectives:

- Introduction to Scripting Language and provides Exposure to various problems solving approaches of computer science
- Analyze the features of Python, Use of operators and control structures in python, python data structures, Analyze the packages of Python and its functions, Object oriented features in python and Sockets of Python.

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully raise Indentation Error and Correct it.

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . 1/10
c) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

Exercise - 6 DS - Continued

a) Write a program combine lists that combines these lists into a dictionary.
b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.
b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are Colliding. Your function should return a Boolean representing whether or not the balls are Colliding. Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius If (distance between two balls centers) <= (sum of their radii) then (they are colliding)
b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.
b) Write a function reverse to reverse a list. Without using the reverse function.
c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints
b) Write a program to perform addition of two square matrices
c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a) Install packages requests, flask and explore them. Using (pip)

b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)

c) Write a simple script that serves a simple HTTPResponse and a simple HTML Page.

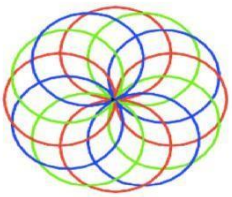
Exercise - 13 OOP

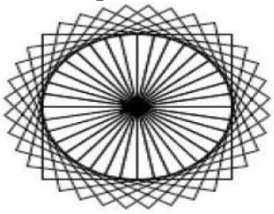
a) Class variables and instance variable

1. Robot 2. ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk.
2. Write a program to implement the following figures using turtle.





Exercise – 15 SOCKETS

1. Develop interactive Chat Room Server using Python Socket Programming.

Exercise – 16 NUMPY MODULE

1. Multiplication of two Matrices in Single line using Numpy in Python.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

WEB REFERENCES:

[1]. https://realpython.com/installing-python/

[2].Madhavan Mukund, (12, may, 2018). Programming, Data Structures & Algorithms using Python [NPTEL]. Available: http://nptel.ac.in/

REQUIREMENTS:

Software Requirements:

- Python versions: 2.7, 3.7
- Operating systems: Windows 7

Hardware Requirements:

- Processors: Intel(R) Pentium(R) CPU G2010 @ 2.80GHz

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1: Implement python programming constructs to build small to large scale applications.

CO2: Implement the problems in terms of real-world objects using OOPs technology.

CO3: Analyze the packages of Python and its functions

CO4: Use various python data structures.

CO5: Evaluate and handle the errors during runtime involved in a program.

CO6:Extract and import packages for developing different solutions for real time problems.

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I Year : II Semester	COURSE CODE: UR20BS212	L	T	P	C
		0	0	3	1.5

Internal: 15 Marks External: 35 Marks

APPLIED CHEMISTRY LAB

(ECE/EEE)

Course objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the chemistry theory.
- To learn the usage of electrical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.

List of Experiments

1. Introduction to Chemistry laboratory Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Qualitative analysis, Quantitative analysisetc.
2. Trial experiment-Estimation of HCl by using standard Na_2CO_3solution.
3. Estimation of Total hardness of water by using standard EDTA solution.
4. Estimation of Zinc using standard EDTA solution.
5. Estimation of Copper using standard EDTA solution.
6. Estimation of P^H of the given sample solution using P^H meter.
7. Conductometric titration between Strong acid and Strong base.
8. Conductometric titration between Strong acid and Weak base.
9. Potentiometric titration between Strong acid and Strong base.
10. Potentiometric titration between Strong acid and Weak base.
11. Estimation of $KMnO_4$ using standard Oxalicacid.
12. Determination of Alkalinity of water.
13. Determination of Viscosity of given sample by Ostwald viscometer.
14. Estimation of Ferric iron using standard $K_2Cr_2O_7$ solution.
15. Estimation of Copper using standard $K_2Cr_2O_7$solution.
16. Preparation of Bakelite(Demo).

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Reference Books

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

Course Outcomes:

Upon the completion of course, student will be able to

CO1: Utilize different Analytical tools and execute experiments involving estimation of raw materials, finished products and environmental samples etc.

CO2: Utilize modern instruments like Conductometer P^H meter and Potentiometer for the analysis of samples

CO3: Determine the total hardness present in water for its quality in drinking purpose

CO4: Estimate the Viscosity of oil and assess its suitability as a lubricant

CO5: Determine the alkalinity present in water for its quality in drinking purpose

CO6: Identify the product weight and colour.

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I Year - II Semester	Course Code : UR20HS213	L	T	P	C
		0	0	3	1.5

Internal: 15 Marks External: 35 Marks

COMMUNICATIVE ENGLISH LAB (ECE/EEE)

Course Objective:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

List of Activities

1) Introducing yourself
2) Greeting
3) Thanking and Responding to thanks
4) Requesting and Responding to requests
5) Making and Responding to complaints
6) Apologising and accepting apologies
7) Consonants : Plosives, Affricates and Nasals
8) Consonants: Fricatives, Liquids and Glides
9) Vowels: Pure vowels
10) Vowels :Dipthongs
11) Consonant clusters
12) Word Accent
13) Word Stress
14) Intonation

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Reference Manuals:

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd

'Strengthen Your Communication Skills' published by Maruthi Publications

Course Outcomes:

Upon completion of the course, the student will be able to:

CO1 Apply expressions in day to day life
CO2 Build language proficiency by using patterns
CO3 Develop communication skills through various language activities
CO4 Outline of Letters and Sounds
CO5 Identify consonants and vowel sounds in phonetic script
CO6 Understand pronunciation, stress and intonation

*****

I Year - II Semester	COURSE CODE: UR20MC200A	L	T	P	C
		0	0	0	0

SCIENCE, TECHNOLOGY AND SOCIETY

(Common to all branches)

Internal Marks:100 **External Marks: 0**

The objectives of this course are to:

1. Enable students to understand science as a socio cultural product in specific historical context;
2. Expose students to philosophical, historical and sociological perspectives on science and technology to look at science as practice deeply embedded in culture and society;
3. Emphasize the dynamic nature of the relations between wider cultural practices, on the one hand, and, scientific practices, on the other in a comparative analytical framework;
4. Introduce students to the perspectives on the relations between science and technology, on the one hand, and, science, technology and society, on the other;
5. Equip students with a theoretical understanding indispensable for an in-depth study of science -society dynamics.
    a. Social Context of Production of Scientific Knowledge;
    b. Organization and Professionalization of Science;
    c. Social Legitimation, Meanings, Interests and Values;
    d. Science – Technology Relationship;
    e. Science in India;
    f. Information and Communication Society and Biotechnology and their Implications;
    g. Science and Ethics;
    h. Scientific Knowledge in India: From Public Resource to Intellectual Property

UNIT-I: Science as Culture

1. Methods of Science: Issues and Perspectives.
2. Social Context of Production of Scientific Knowledge.
3. Demarcation, Autonomy and Cognitive Authority of Science.
4. Challenges: Cognitive, Legal, Ethical, Feminist and Ideological.
5. Science as Social Institution and Ethos of Science.
6. Inequalities in Science.
7. Critique of the Mertonian Paradigm.
8. Knowledge Production: Social and Cultural Contexts.

UNIT-II: Society and Culture

1. Social Legitimation.
2. Meanings, Interests, Values and the Modern State.

UNIT-III: Perspectives on Science - Technology

1. Hierarchical, Symbiotic and Coalescing.
2. Science and Technology, and their Human Roots: Philosophy of Science and Technology.
3. Technology as Knowledge.
4. Technological Shaping of Society and Social Shaping of Technology.

UNIT-IV: Emerging Technologies

1. Automation and Robotics
2. Building Information Modeling (BIM)
3. Data Science and AI
4. 5G Cellular and VLSI
5. Electric Vehicles

UNIT-V: Science: From Public Resource to Intellectual Property

1. Changing Context of the Production of Knowledge.
2. The Intellectual Property Rights Regime.
3. Science: From Curiosity driven Research to Contract Obligations.

References:

1. A.F. Chalmers (1976) What is this thing called Science? Milton Keynes: The Open University Press.
2. T.S. Kuhn (1970) The Structure of Scientific Revolutions. Chicago: Chicago University Press
3. D. Oldroyd (1986) The Arch of Knowledge: An Introductory Study of the Philosophy and Methodology of Science. New York and London: Methuen.
4. D. Bloor (1991) Knowledge and Social Imagery. Chicago: The University of
Chicago Press.
5. M. Biagioli ed., (1999) The Science Studies Reader. New York: Routledge
6. H.M. Collins and T. Pinch (1993) The Golem: What Everyoneshould Know about Science. Cambridge University Press.
7. L. Daston (1995) 'The Moral Economy of Science', Osiris, 10: 3-24.
8. R.K. Merton (1973) The Sociology of Science: Theoretical and Empirical Investigations. Chicago: Chicago University Press.

Course Outcomes:

Upon completion of the course, the students will be able to

CO1.Distinguish different Methods of Science.

CO2.Get the Knowledge on Society and Culture.

CO3.Familiarize with the concepts of Philosophy of Science and Technology.

CO4.Acquire the Knowledge on Emerging Technologies.

CO5.Know the Intellectual Property Rights.

CO6.Understand the Scientific Knowledge in India.

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I Year - II Semester	COURSE CODE: UR20MC200B	L	T	P	C
		0	0	0	0

SOCIAL SERVICE ACTIVITY-I

(NCC/NSS/SOCIAL SERVICE CLUB)

(Common to all branches)

All undergraduate students shall register for NCC/NSS/Social service club. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student actively participates in the prescribed activities and maintains more than 75% of attendance, satisfactory grade will be awarded. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

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NUMERICAL METHODS AND TRANSFORMS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations.
2. To familiarize the students with numerical methods of solving the non-linear equations.
3. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT–I

Solution to algebraic equations Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi method, Iteration method, Newton-Raphson method.

UNIT–II

Interpolation Finite differences, interpolation using Newton's forward and backward difference formulae, Gauss forward and backward interpolation formulae, Interpolation with unequal intervals, Newton's divided difference and Lagrange's formulae.

UNIT–III

Numerical integration and Solution of ODE Numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations- Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first order ODE.

UNIT–IV

Laplace Transforms Laplace transforms of elementary functions, Properties of Laplace Transforms of derivatives and integrals, Multiplication by t, Division by t, Inverse Laplace transforms-Method of Partial fractions, Applications of Ordinary differential equations.

UNIT–V

Fourier Transforms Fourier integral theorem (without proof), Fourier sine and cosine integral, Fourier transforms, Fourier sine and cosine transforms, Properties of Fourier transforms.

TEXT BOOK:

1. Higher Engineering Mathematics, B.S. Grewal.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin kreyszig.

2. Introductory methods of Numerical Analysis by S.S.Sastri.

E-RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/

2. https://nptel.ac.in/courses/111/105/111105123/

Course Outcomes:

Upon completion of the course, the students will be able to

1. Evaluate approximating the roots of polynomial and transcendental equations by different algorithms.
2. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.
3. Apply definite integral of a function by using different numerical methods.
4. Apply definite integral of a function by using different numerical methods.
5. Apply the Laplace and Inverse Laplace Transform for different types of functions and evaluate ordinary differential equations using Laplace transform technique.
6. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non – periodic waveforms

B.Tech. III Semester	COURSE CODE:UR20ES302	L	T	P	C
		3	0	0	3

NETWORK ANAYSIS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To know the basic Laplace transforms techniques in periods' waveforms.
4. To understand the basic theorems and resonance.
5. To understand the two port network parameters and synthesis of networks

UNIT – I

INTRODUCTION TO ELECTRICAL CIRCUITS : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination.

NETWORK TOPOLOGY: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule, Principal of Duality with examples (Text Books: 2,3, Reference Books: 3)

UNIT – II

TRANSIENTS: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non- homogenous, problem solving using R-L-C elements with DC excitation and AC excitation. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – III

STEADY STATE ANALYSIS OF A.C CIRCUITS: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L- C, problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

COUPLED CIRCUITS: Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT – IV

RESONANCE: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

NETWORK THEOREMS: Superposition, Thevinins, Nortons, Milliman's, Reciprocity, Compensation, Substitution,Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, ReferenceBooks:2)

UNIT – V

TWO-PORT NETWORKS: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks. (Text Books: 1,2, Reference Books: 1,3)

NETWORK SYNTHESIS: Introduction, Hurwitz polynomial, properties of Hurwitz polynomial, positive real functions, necessary and sufficient conditions for positive real functions

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rdEdition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju,CengageLearning
3. Electric Circuit Analysis by Hayt and Kimmarle,TMH

REFERENCE BOOKS:

1. Network lines and Fields by John. D. Ryder 2ndedition, Asiapublishinghouse.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers. 3.Network Analysis and Filter Design by Chadha,UmeshPublications..

E-RESOURCES:

1. https://nptel.ac.in/courses/108/105/108105159/
2. https://onlinecourses.nptel.ac.in/noc20_ee46/preview

Course Outcomes:

Upon completing this course, the student will be able to

1 .get the knowledge on basic network elements.
2. analyze the RLC circuits behavior in detailed.
3. understand the performance of periodic waveforms.
4. gain the knowledge in theorems and resonance
5. gain the knowledge in characteristics of two port network parameters (Z,Y,ABCD,h&g) and synthesis of networks

.B.Tech. III Semester	COURSE CODE: UR20PCEC303	L	T	P	C
		3	0	0	3

ELECTRONIC DEVICES AND CIRCUITS

Internal Marks: 30
External Marks: 70

Course Objectives

1. To learn and understand the basic concepts of semiconductor physics.
2. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4. Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
5. To learn and understand the purpose of transistor biasing and its significance.

UNIT-I

REVIEW OF SEMICONDUCTOR PHYSICS: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

JUNCTION DIODE CHARACTERISTICS : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II

SPECIAL SEMICONDUCTOR DEVICES: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics.

RECTIFIERS AND FILTERS: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter, comparison of various filter circuits in terms of ripple factors.

UNIT-III

TRANSISTOR CHARACTERISTICS:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristicsμ, gm, rd parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT-IV

TRANSISTOR BIASING AND THERMAL STABILIZATION

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE}, Ic, and β, Stability factors, (S,S',S''), Bias compensation, Thermal runaway, Thermal stability.

FET Biasing-methods and stabilization.

UNIT-V

SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER MODELS:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits-J.Millman,C. Halkias, TataMc-Graw Hill, Second Edition, 2007
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016
3. Electronics devices & circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition,2009

REFERENCE BOOKS:

1. Integrated Electronics-J. Millman, C. Halkias, TataMc-Graw Hill, Second Edition, 2009
2. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications
3. Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, TataMc-GrawHill, 4thEdition,2008

E-RESOURCES:

1 .https://nptel.ac.in/courses/117/103/117103063/

2. https://onlinecourses.nptel.ac.in/noc21_ee55/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Apply the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifier switch and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
6. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

B.Tech. III Semester **COURSE CODE: UR20PCEC304**

L	T	P	C
3	0	0	3

SWITCHING THEORY AND LOGIC DESIGN

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To solve a typical number base conversion and analyze new error coding techniques.
2. Theorems and functions of Boolean algebra and behavior of logic gates.
3. To optimize logic gates for digital circuits using various techniques.
4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods.
5. To understand concepts of combinational circuits.
6. To develop advanced sequential circuits.

UNIT-I

REVIEW OF NUMBER SYSTEMS & CODES:

Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code -etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems, Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT–II

MINIMIZATION TECHNIQUES:

Minimization and realization of switching functions using Boolean theorems, K- Map (up to 6 variables) and tabular method (Quine-mc cluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN*:*

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converter using Karnaugh method and draw the complete circuit diagrams.

UNIT–III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

INTRODUCTION OF PLD's :

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table, merits and demerits of PROM, PAL, PLA comparison.

UNIT–IV

SEQUENTIAL CIRCUITS - I:

Classification of sequential circuits (synchronous and asynchronous), operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi- directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions
7474,7475,7476,7490,7493,74121.

UNIT–V

SEQUENTIAL CIRCUITS - II :

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice- versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rdEdition, UniversityPress,2009.
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHI publication, 2008.
3. Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012

REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006
2. Digital electronics by R S Sedha.S.Chand&companylimited,2010
3. Switching Theory and Logic Design by A. Anand Kumar, PHI Learningpvtltd,2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning, 2006.

E-RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://onlinecourses.nptel.ac.in/noc19_cs74/preview

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand Number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters
5. Know operation and design methodology for synchronous sequential circuits and algorithmic state machines.
6. Produce innovative designs by modifying the traditional design techniques

B.Tech. III Semester	COURSE CODE: UR20PCEC305	L	T	P	C
		3	0	0	3

SIGNALS AND SYSTEMS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To study about signals and systems.
2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
3. To understand the characteristics of systems.
4. To introduce the concept of sampling process
5. To know various transform techniques to analyze the signals and systems.

UNIT-I

INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related problems.

UNIT–II

FOURIER SERIES :

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum.

UNIT-III

FOURIER TRANSFORM:

Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT–IV

ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant(LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through asystem, Signal bandwidth, system

bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and risetime.
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT–V

SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Related problems.
LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

TEXT BOOKS:

1. Signals, Systems & Communications-B.P.Lathi, BSPublications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn,1997.
3. Signals &Systems-SimonHaykinandVanVeen,Wiley,2ndEdition, 2007

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals–BP Lathi, Oxford University Press,2015
2. Signals and Systems–TK Rawat, Oxford University press,2011

E-RESOURCES:

1. https://nptel.ac.in/courses/108/104/108104100/
2. https://nptel.ac.in/courses/108/106/108106163/

Course Outcomes:

Upon completing this course, the student will be able to:

1. Differentiate the various classifications of signals and systems
2. Analyze the frequency domain representation of signals using Fourier concepts
3. Classify the systems based on their properties and determine the response of LTI Systems.
4. Know the sampling process and various types of sampling techniques.
5. Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).
6. Know the properties of correlation

B.Tech. III Semester	COURSE CODE: UR20PCEC306	L	T	P	C
		3	0	0	3

RANDOM VARIABLES AND STOCHASTIC PROCESSES

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
2. To mathematically model the random phenomena with the help of probability theory Concepts.
3. To introduce the important concepts o random variables and stochastic processes.
4. To analyze the LTI systems with stationary random process as input.

UNIT-I

THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution anddensityfunctions,Properties,Binomial,Poisson,Uniform,Gaussian,Exponenti al,Rayleigh,ConditionalDistribution,ConditionalDensity,Properties.

UNIT-II

OPERATION ON ONE RANDOM VARIABLE-EXPECTATIONS: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT-III

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and

Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and 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, Gaussian Random Processes, Poisson Random Process.

UNIT-V

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

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross- Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Bandpass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4thEdition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha,PHI,4thEdition, 2002
3. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W.Woods, Pearson Education, 3rdEdition,2011

REFERENCE BOOKS:

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P.Lathi, International Text Book, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill,2015.

E-RESOURCES:

1. https://nptel.ac.in/courses/117/105/117105085/
2. https://nptel.ac.in/courses/111/102/111102111/

Course Outcomes:

Upon completing this course, the student will be able to

1. Understand the concepts of Probability and Random Variables.
2. Know the Operations on single & multiple random variables – expectations.
3. Mathematically model the random phenomena and solve simple probabilistic problems.
4. Identify different types of random variables and compute statistical averages of these random variables.
5. Characterize the random processes in the time and frequency domains.
6. Analyze the LTI systems with random inputs.

B.Tech. III Semester | COURSE CODE: UR20PCEC311 | L T P C | 0 0 3 1.5

ELECTRONIC DEVICES AND CIRCUITS LAB

Internal Marks: 15
External Marks: 35

Course Objectives:
1. Know the functionality of electronic components.
2. Observe the characteristics of Electronic Devices

List of Experiments:
(Minimum of 12 Experiments has to be performed)

1. Study of Active and passive components

2. PN Junction diode characteristics:
   Part A: Germanium Diode (Forward bias & Reverse bias).

   Part B: Silicon Diode (Forward bias only).

3. Zener diode characteristics and Zener as voltage Regulator.

4. Half Wave Rectifier with & without filters.

5. Full Wave Rectifier with & without filters.

6. Input and Output characteristics of BJT in CE configuration

7. FET characteristics in CS configuration

   Part A: Drain characteristics.

   Part B: Transfer characteristics.

8. SCR Characteristics.

9. UJT Characteristics.

10. Transistor Biasing

11. CRO Operation and its Measurement

12. BJT-CE Amplifier

13. Emitter Follower-CC Amplifier

14. FET-CS Amplifier

Equipment Required:
1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats

6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES:

1. https://nptel.ac.in/courses/122/106/122106025/

Course Outcomes:

Upon completion of the course, the student will able to

1. Measure voltage, frequency and phase of any waveform using CRO and resistor colour coding.
2. Design and analysis of circuits like PN junction diode,
3. Design and analysis of Zener diode and
4. Design and analysis of Rectifiers
4. Observe the SCR Characteristics
5. Understand the Transistor Biasing
6. Find the gain of CE and CS Amplifiers

B.Tech. III Semester **COURSE CODE: UR20SOEC312**

L	T	P	C
1	0	2	2

JAVA PROGRAMMING

Internal Marks: 0
External Marks: 50

Course Objectives:

1. The aim of this course is to Practice programming in the Java
2. Gain knowledge of object-oriented paradigm in the Java programming Language.
3. Learn use of Java in a variety of technologies and on different platforms.

TOPICS

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)

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

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for “super” keyword.

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

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw

b) Write a JAVA program for creation of Illustrating finally

c) Write a JAVA program for creation of Java Built-in Exceptions

d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating is Alive and join ()

c) Write a Program illustrating Daemon Threads.

Note: Skill Oriented Course will be evaluated at the end of the semester for 50 marks (record -15 marks and viva voce -35 marks) along with laboratory end examinations in the presence of external (Appointed by the Principal) and internal examiner (course instructor or mentor).There are no internal marks for the job oriented skill courses

TEXT BOOKS:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. The complete Reference Java, 8th edition, Herbert Schildt, TMH.

REFERENCES BOOKS:

1. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson 2. Murach's Java Programming, Joel Murach

E-RESOURCES:

1. https://nptel.ac.in/courses/106/102/106102064/

Course Outcomes:

After the completion of the lab course the student will be able to:

1. write java program for Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings.
2. Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism,
3. Understand the User defined Exception handling mechanism
4. Illustrate simple inheritance, multi-level inheritance,
5. gain knowledge on Exception handling mechanism.
6. Construct Threads

B.Tech. III Semester **Course Code: UR20MC300C**

L	T	P	C
0	0	0	0

ENVIRONMENTAL SCIENCE

Internal Marks: 30
External Marks: 00
End Semester Marks: 70

Course Objectives: The objectives of the course is to impart

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

SYLLABUS:

UNIT–I Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II Natural Resources: Natural resources and associated problems Forest resources–Use and over–exploitation, deforestation–Timber extraction– Mining, dams and other effects on forest and tribal people Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Literate, Coal, Sea and River sands. Food

resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity Energy resources: Growing energy needs, renewable and non- renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT–III Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT–IV Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT–V Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

TEXT BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada.
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi.
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi.

E-RESOURCE:

1. https//nptel.ac.in/courses/120/108/120108004

COURSE OUTCOMES: At the end of the course student should have gained knowledge on

1. The natural resources, ecology, Biodiversity, and conservation of natural resources
2. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
3. Social issues both rural and urban environment and the possible means to combat the challenges
4. The Environmental Impact Assessment and environmental legislations of India and global initiatives towards sustainable development.
5. Understanding the concept of Biodiversity and its conservation
6. Understanding the concept of Solid Waste Management

B.Tech. III Semester	COURSE CODE: UR20MC300D	L	T	P	C
		0	0	0	0

SOCIAL SERVICE ACTIVITY-II

(NCC/NSS/SOCIAL SERVICE CLUB)

(Common to all branches)

All undergraduate students shall register for NCC/NSS/Social service club. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student actively participates in the prescribed activities and maintains more than 75% of attendance, satisfactory grade will be awarded. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

B.Tech. IV Semester	COURSE CODE: UR20ES401B	L	T	P	C
		3	0	0	3

LINEAR CONTROL SYSTEMS

Internal Marks: 30
External Marks: 70

Course Objectives

1. To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
2. To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
3. To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
4. To analyze the system in terms of absolute stability and relative stability by different approaches
5. To design different control systems for different applications as per given specifications
6. To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

UNIT-I

INTRODUCTION

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed- Back Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT-II

TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples –Block diagram algebra–Representation by Signal flow graph-Reduction using mason's gain formula.

TIME RESPONSE ANALYSIS: Standard test signals-Time response of first order systems–Characteristic Equation of Feedback control systems, Transientresponseofsecondordersystems-Timedomainspecifications–Steady state response-Steady state errors and error constants.

UNIT-III

STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability– limitations of Routh's stability.

ROOT LOCUS TECHNIQUE:

The root locus concept-construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT-IV

FREQUENCY RESPONSE ANALYSIS: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT-V

CLASSICALCONTROLDESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design infrequency Domain, PID Controllers. State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties –Concepts of Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition – by B.C.Kuo–John wiley and son's,2003.
2. ControlSystemsEngineering–byI. J .Nagrath and M.Gopal, New Age International(P) Limited, Publishers, 2ndedition,2007
3. Modern Control Engineering – by Katsuhiko Ogata–Pearson Publications, 5thedition,2015.

REFERENCE BOOKS:

1. ControlSystems by A.Nagoor kani, RBA publications, 3edition,2017.
2. Control Systems by A.Anandkumar,PHI,2Edition,2014.

E-RESOURCES

1. https://nptel.ac.in/courses/107/106/107106081/
2. https://nptel.ac.in/courses/108/107/108107115/

Course Outcomes

Upon completing this course, the student will be able to

1. Know the open and closed loop control systems
2. understand the concepts of feedback and its advantages to various control systems
3. Design the control system in time-domain and frequency domain
4. Control systems for various applications
5. Understand conventional approach, the state space approach for the analysis
6. Get the knowledge on Controllability and Observability.

B.Tech. IV Semester	COURSE CODE: UR20HS402C	L	T	P	C
		3	0	0	3

MANAGEMENT SCIENCE

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To familiarize with the process of management, principles, leadership styles and basic concepts on Organization.
2. To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.
3. To provide basic insight into select contemporary management practices and Strategic Management.
4. To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
5. To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management.

UNIT I

INTRODUCTION TO MANAGEMENT:

Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure

UNIT II

OPERATIONS MANAGEMENT:

Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT III

FUNCTIONAL MANAGEMENT:

Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans(Simple Problems) – Job Evaluation and Merit Rating - Marketing Management Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationlizing change through performance management.

UNIT IV

PROJECT MANAGEMENT:

(PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems), Strategic Management: Vision, Mission, Goals, Strategy – Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies.

UNIT V

CONTEMPORARY MANAGEMENT PRACTICE:

Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management , Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

TEXTBOOKS:

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, 'Management Science' Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, Management Science' TMH 2011.

REFERENCE BOOKS:

1. Koontz & Weihrich: 'Essentials of management' TMH 2011
2. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011
3. Robbins: Organizational Behaviour, Pearson publications, 2011
4. Kanishka Bedi: Production & Operations Management, Oxford Publications, 2011
5. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
6. Biswajit Patnaik: Human Resource Management, PHI, 2011
7. Hitt and Vijaya Kumar: Starategic Management, Cengage learning
8. Prem Chadha: Performance Management, Trinity Press(An imprint of Laxmi Publications Pvt. Ltd.) Delhi 2015.
9. Anil Bhat& Arya Kumar : Principles of Management, Oxford University Press, New Delhi, 2015

E-RESOURCES

1. https://courses.lumenlearning.com/wm-organizationalbehavior/chapter/assignments/
2. https://nptel.ac.in/courses/110/105/110105034/

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Acquire the knowledge on management functions, global leadership and organizational structure.
2. Familiarize with the concepts of functional management that is HRM and Marketing of new product developments.
3. Think in strategically through contemporary management practices.
4. develop positive attitude through personality development and can equip with motivational theories.
5. Attain the group performance and grievance handling in managing the organizational culture.
6. Understand the coping strategies of stress.

B.Tech. IV Semester	COURSE CODE: UR20PCEC403	L	T	P	C
		3	0	0	3

ELECTRONIC CIRCUIT ANALYSIS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
2. Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
3. Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
4. Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
5. Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
6. Analyze different types of tuned amplifier circuits.

UNIT-I

SMALL SIGNAL HIGH FREQUENCY TRANSISTOR AMPLIFIER MODELS:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

MULTISTAGE AMPLIFIERS: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis- Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT-III

FEEDBACK AMPLIFIERS : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT-IV

OSCILLATORS: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V

POWER AMPLIFIERS: Classification of amplifiers (A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks.

TUNED AMPLIFIERS: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, staggered tuned amplifiers, Stability of tuned amplifiers.

TEXT BOOKS:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd Ed., 2010
2. Electronic Devices and Circuits Theory –Robert L.Boylestad and Louis Nashelsky, Pearson/Prentice Hall, TenthEdition,2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearsonpublications,2006

REFERENCE BOOKS:

1. Electronic Circuit Analysis and Design –Donald A.Neaman, McGraw Hill, 2010.
2. Microelectronic Circuits- Sedra A.S. and K.C. Smith, Oxford University Press, SixthEdition,2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, Pearson Publications.

E-RESOURCES:

1. https://nptel.ac.in/courses/108/102/108102095/
2. https://nptel.ac.in/courses/108/102/108102097/

Course Outcomes:

Upon completing this course, the student will be able to

1. Design and analysis of small signal high frequency transistor amplifier using BJT.
2. Design and analysis of small signal high frequency transistor amplifier using FET.
3. Design and analysis of multistage amplifiers using BJT and FET
4. Design and analysis of Differential amplifier using BJT.
5. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
6. Know the classification of the power and tuned amplifiers and their analysis with performance comparison.

B.Tech. IV Semester **COURSE CODE: UR20PCEC404**

L	T	P	C
3	0	0	3

DIGITAL IC DESIGN

Internal Marks: 30
External Marks: 70

Course Objectives:

1. Introduction of digital logic families and interfacing concepts for digital design is considered.
2. VHDL fundamentals were discussed to modeling the digital system design blocks
3. Design and implementation of combinational and sequential digital logic circuits is explained.

UNIT-I

HARDWARE DESCRIPTION LANGUAGES

VHDL: Introduction to VHDL, entity declaration, architecture, data-flow, behavioral and structural style of modelings data types, data objects, configuration declaration, package, generic, operators and identifiers, PROCESS,IF, CASE & LOOP statements, VHDL libraries.

Verilog HDL: Introduction to Verilog HDL, data types, data operators, module statement, wire statement, if-else statement, case-end case statement, Verilog syntax and semantics (qualitative approach)

UNIT-II

COMBINATIONAL LOGIC DESIGN: Parallel binary adder, carry look ahead adder, BCD adder, Multiplexers and demultiplexers and their use in combinational logic design, ALU, digital comparators, parity generators, code converters, priority encoders. (Qualitative approach of designing and modeling the mentioned combinational logic circuits with relevant digital ICs using HDL)

UNIT-III

SEQUENTIAL LOGIC DESIGN: Registers, applications of shift registers, ripple or asynchronous counters, synchronous counters, synchronous and asynchronous sequential circuits, hazards in sequential circuits. (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs using HDL)

UNIT-IV

COMBINATIONAL MOS LOGIC CIRCUITS: Introduction, MOS logic circuits with depletion nMOS loads: two-input NOR gate, generalized NOR structure with multiple inputs, transient analysis of NOR gate, two-input NAND gate, generalized NAND structure with multiple inputs, transient analysis of NAND gate, CMOS logic circuits: CMOS NOR2 gate, CMOS NAND2 gate, omplex logic circuits, complex CMOS logic gates, AOI and OAI gates, Pseudo-n MOS gates, CMOS full-adder circuit, CMOS transmission gates (Pass Gates), complementary pass-transistor logic.

UNIT-V

SEQUENTIAL MOS LOGIC CIRCUITS: Introduction, behavior bistable elements, SR latch circuit, clocked latch and flip-flop circuits: clocked SR latch, clocked JK latch, master-slave flip-flop, CMOS D-latch and Edge-triggered flip- flop, Schmitt trigger circuit, basic principles of pass transistor circuits.

TEXT BOOKS:

1. Modern Digital Electronics–R.P.Jain - Fourth Edition–Tata McGraw Hill Education Private Limited,2010.
2. CMOS Digital Integrated Circuits-Analysis and Design–Sung-Mo Kang & Yusuf Leblebici-Tata McGraw Hill Publishing Company Limited, 2006.
3. VHDL/Verilog Primer - J.Bhasker, Pearson Education/PHI,3rdEdition.

REFERENCE BOOKS:

1. Digital Design Principles & Practices-John F.Wakerly, PHI / Pearson Education Asia, 3rdEdition, 2005.
2. Fundamentals of Digital Logic with VHDL Design-Stephen Brown, Zvonko Vranesic, McGrawHill,3rd Edition.

E-RESOURCES

1. http://www.ee.iitm.ac.in/vlsi/courses/ee5311_2017
2. https://nptel.ac.in/courses/108/106/108106158/

Course Outcomes:

After undergoing the course, students will be able to

1. Understand the structure of commercially available digital integrated circuit families.
2. Learn the IEEE Standard1076 Hardware Description Language (VHDL).
3. Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping.
4. Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
5. Understand the CMOS D-latch and Edge-triggered flip-flop
6. Gain the knowledge on CMOS transmission gates

B.Tech. IV Semester	COURSE CODE: UR20PCEC405	L	T	P	C
		3	0	0	3

ANALOG COMMUNICATIONS

Internal Marks: 30
External Marks: 70

Course Outcomes

Upon completing this course, the student will be able to

1. Familiarize with the fundamentals of analog communication systems.
2. Familiarize with various techniques for analog modulation and demodulation of signals.
3. Distinguish the figure of merits of various analog modulation methods.
4. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
5. Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

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UNIT-I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT-II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.

UNIT-III

ANGLE MODULATION: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrowband FM, Wideband FM, Constant Average Power, Transmission bandwidth of FM Wave- Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop. Comparison of FM & AM.

UNIT-IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter –Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics -Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits.

UNIT-V

NOISE: Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

PULSE MODULATION: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems–H Taub & D.Schilling, Gautam Sahe, TMH, 3rd Edition,2007.
2. Principles of Communication Systems – Simon Haykin, John Wiley, 2ndEdition, 2007.
3. Modern Digital and Analog Communication Systems –B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press,4thEdition,2017

REFERENCE BOOKS:

1. Electronics and Communication System– George Kennedy and Bernard Davis, TMH 2004.
2. Communication Systems–R.P.Singh, SP Sapre,SecondEditionTMH,2007.
3. Electronic Communication systems–Tomasi, Pearson, fourthEdition,2007.

E-RESOURCES:

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-36-communication-systems-engineering-spring-2009/lecture-notes/

Course Outcomes:

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

1. Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
2. Analyze noise characteristics of various analog modulation methods
3. Analyze various functional blocks of radio transmitters and receivers
4. Design simple analog systems for various modulation techniques.
5. Understand the concepts of noise and various types of noise sources in analog communication systems.
6. Know the pulse modulation techniques and multiplexing techniques.

B.Tech. IV Semester | COURSE CODE: UR20PCEC411 | L T P C | 0 0 3 1.5

ELECTRONIC CIRCUIT ANALYSIS LAB

Internal Marks: 15
External Marks: 35

Course Objectives:

1. To illustrate the students different analog electronic circuit and their application in practice.
2. To impart knowledge on assessing performance of analog electronic circuit through monitoring of sensitive parameters.
3. To evaluate the use of computer-based analysis tools to review performance of semiconductor device circuit.

Note: The students are required to design the circuit and perform the simulation using Multisim / Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

List of Experiments: :

(Minimum of Twelve Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. ClassB Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required:
Software:
i. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
ii. Computer Systems with required specifications

Hardware:

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

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semesterend examinations.In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES

1. http://vlabs.iitkgp.ernet.in/be/
2. http://hecoep.vlabs.ac.in/List%20of%20experiments.html?domain=ElectronicsandCommunications

Course Outcomes:

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

1. Comprehence the fundaments of multistage amplifiers, feedback, power amplifiers and oscillator circuits
2. Analyze the circuit design process and simulate the feedback amplifiers
3. Acquaint with the design and simulate the RC coupled amplifier circuits.
4. Discriminate the design and simulate various oscillator circuits.
5. Interpret to design and simulate Darlington pair Amplifier.
6. Create the design and simulate the cascade, class A power amplifier circuits, and single tuned voltage amplifier circuits

B.Tech. IV Semester	COURSE CODE: UR20PCEC412	L	T	P	C
		0	0	3	1.5

DIGITAL IC DESIGN LAB

Internal Marks: 15
External Marks: 35

Course Objectives:

1. To make the students familiarize with the design of Digital Integrated Circuits.
2. To draw schematic and layout, analyze, and perform simulation of Digital Integrated Circuits using relevant simulator

Note: The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop VHDL/Verilog HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer. Minimum two experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

Part-A (Minimum of 6 experiments to be performed)

Experiments using components:

1. Realization of Gates using Discrete Components.

2. Design of Combinational Logic Circuits like Half – adder, Full – adder, Half–sub tractor and Full-Sub tractor.

3. Design of Code Converters (Binary to Gray).

4. Design of Code Converters (Gray to Binary)

5. Design of Encoders like 4:2 and 8:3 encoder.

6. Verification of Truth Table of Flip-Flops using Gates.

7. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

Part-B (Minimum of 6 experiments to be performed)

Experiments using HDL:

8. Design of Multiplexers/De Multiplexers

9. Design of Encoder/ Decoders.

10. Construction of Flip-Flops using Gates (NAND & NOR).

11. Conversion of Flip-Flops (JK-T, JK – D).

12. Design of Shift register (To Verify Serial to parallel, parallel to Serial, Serial to Serial and Parallel to parallel Converters) using Flip-Flops.

13. Design of Asynchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

14. Construction of a clock pulse of 1 MHZ/ 2 MHZ/ 10 MHZ etc…

Hardware:

1. Regulated Power supplies
2. Digital Storage Oscilloscopes
3. Digital Function Generators
4. Digital Multimeters
5. FPGA kit

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

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

1. Design and realization of logic gates on trainer kit and software.
2. Design of digital circuits based on logic gates adder/subtractor.
3. . Design of registers and counters, flip-flops.
4. Synthesize digital circuit using Verilog HDL/ VHDL
5. Design the combinational circuits
6. Design the sequential circuits and Implement the Digital circuits in FPGA Kit.

B.Tech. IV Semester	COURSE CODE: UR20PCEC413	L	T	P	C
		0	0	3	1.5

ANALOG COMMUNICATIONS LAB

Internal Marks: 15
External Marks: 35

Course Objectives:
1. To analyze various modulation techniques in communications.
2. To analyze various FM and FM-Demodulation process in communication.

List of Experiments:
The students have to calculate the relevant parameters
(a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

Note: The below experiments are to be executed /completed using hardware boards(Minimum of 8 experiments to performed) and also simulated on Matlab (Minimum of 6 experiments to performed)

1. Amplitude Modulation -Modulation &Demodulation
2. AM-DSBSC-Modulation &Demodulation
3. Spectrum Analysis of Modulated signal using Spectrum Analyzer
4. Diode Detector
5. Pre-emphasis&De-emphasis
6. Frequency Modulation–Modulation &Demodulation
7. AGC Circuits
8. Verification of Sampling Theorem
9. Pulse Amplitude Modulation &Demodulation
10. PWM, PPM–Modulation & Demodulation
11. PLL IC-565 as FM demodulator
12. Radio receiver characteristics
13. Time Division Multiplexing
14. Characteristics of Mixer

Equipments& Software required:
Software:
i.) Computer Systems with latest specifications
ii) Connected in LAN (Optional)
iii) Operating system (Windows/Linux software)
iv) Simulations software (Simulink & MATLAB)
Equipment:
1. RPS-0 –30V
2. CRO-0– 20M Hz.
3. Function Generators-0 – 1 MHz
4. Components and Breadboards
5. Multimetersand other meters
6. Spectrum Analyzer

Note: Minimum 14 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E-RESOURCES

1.https://vlab.amrita.edu/index.php?sub=59&brch=163&sim=260&cnt=2644

Course Outcomes:

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

1. Get knowledge on matlab to write matlab code for modulation techniques in analog communications and its related circuits.
2. Comprehend the fundamentals in explain the functionality of modulation and demodulation environment.
3. Analyze the concepts, write and simulate the concepts of AM and AM Demodulation process in Communication.
4. Know the origin and simulation of FM and FM-Demodulation process in communication.
5. Acquaint with AM and FM basic functionalities.
6. Design of AGC circuits and sampling theorem concepts.

B.Tech. IV Semester	COURSE CODE: UR20SOEC414	L	T	P	C
		0	0	4	2

SOFT SKILLS

Internal Marks: 0
External Marks: 50

Course Objectives:

1. To Develop effective communication skills (spoken and written).
2. To Develop effective presentation skills.
3. To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.

TOPICS:

1. Group Discussion–dynamics of group discussion, Lateral thinking, Brain storming.
2. Interview Skills– concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.
3. Meetings-making meeting effective, chairing a meeting, decision-making, seeking opinions, interrupting and handling interruptions, clarifications, closure, Negotiation skills.
4. Listening comprehension – Achieving ability to comprehend material delivered at relatively fast speed; comprehending spoken material in Standard Indian English, British English, and American English.
5. Cross-Cultural Communication / Non-Verbal Communication, Problems of Language, Lack of Language equivalency/ difficulties in using English.
6. Vocabulary building, Creativity in using Advertisements, Case Studies etc.
7. Personality Development: Decision-Making, Problem Solving, Goal Setting, Time Management & Positive Thinking.
8. Resume writing –structure and presentation, planning, defining the career objective.
9. Writing Skills–Letter writing, Email etiquette; Essays for competitive examinations, Analyzing newspaper articles.

10. Technical Report Writing/Project Proposals–Types of formats and styles, subject matter–organization, clarity,
11. Coherence and style, planning, data-collection, tools, analysis.-Progress and Project Reports.

Note: Skill Oriented Course will be evaluated at the end of the semester for 50 marks (record -15 marks and viva voce -35 marks) along with laboratory end examinations in the presence of external (Appointed by the Principal) and internal examiner (course instructor or mentor).There are no internal marks for the job oriented skill courses.

REFERENCE BOOKS:

1. M.Ashraf Rizvi, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Ltd.2005.
2. Andrea J.Rutherford, "Basic Communication Skills for Technology" 2nd Edition, Pearson Education, 2007.
3. Meenakshi Raman & Sangeeta Sharma ,"Technical Communication", Oxford University Press,2011.
4. DELTA's key to the Next Generation TOEFLTest: "Advanced Skill Practice," NewAge

Course Outcomes:

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

1. communicate Effectively through verbal/oral communication and improve the listening.
2. Write precise briefs or reports and technical documents.
3. Participate in group discussion / meetings / interviews and prepare and deliver presentations.
4. Become more effective individual through goal/target setting.
5. Become self motivated and practicing creative thinking
6. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work.

B.Tech. IV Semester	COURSE CODE: UR20SOEC414	L	T	P	C
		0	0	0	4

COMMUNITY SERVICE PROJECT

Internal Marks: 0
External Marks: 100

Objectives:

1. To facilitate an understanding of the issues that confront the vulnerable / marginalized sections of society.
2. To initiate team processes with the student groups for societal change.
3. To provide students an opportunity to familiarize themselves with the urban / rural community they live in.
4. To enable students to engage in the development of the community.
5. To plan activities based on the focused groups.
6. To know the ways of transforming society through systematic programme implementation.

IMPLEMENTATION OF COMMUNITY SERVICE PROJECT:

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. The mentor should be a faculty member. Incentive could be given to the faculty mentors in terms of Academic Performance Indicators (API) scores. Or could even be made a compulsory in the service conditions laid down at the time of appointment.
4. 4 Credits to be allocated for Community Service Project within the Choice Based Credit System (CBCS).
5. The 180 hours of Community Service Project could be done in different areas.
6. Specific Departments could concentrate on their major areas of concern.

For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house- wives, etc… Dept. of Zoology or other life sciences departments could concentrate on health awareness, blood groupings, awareness on blood donation or organ donation, etc. Dept. of Mathematics and Statistics could dwell upon empowering the youth with analytical skills, Dept. of Commerce could create awareness on GST or Income Tax Returns or other taxes or consumerism.

7. Sky will be the limit for organizing different programmes, provided the faculties are sufficiently motivated.
8. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
9. The log book has to be countersigned by the concerned mentor/faculty incharge.
10. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.

11. The final evaluation to be reflected in the grade memo of the student.
12. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
13. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.

Assessment Model:

- There shall only be internal evaluation.
- The Faculty Guide assigned is in-charge of the learning activities of the students and for the comprehensive and continuous assessment of the students.
- The assessment is to be conducted for 100 marks.
- The number of credits assigned is 4. Later the marks shall be converted into grades and grade points to include finally in the SGPA and CGPA.

- The weightings shall be:
  - o Activity Log 20 marks
  - o Community Service Project Implementation 30 marks
  - o Mini Project Work 25 marks
  - o Oral Presentation 25 marks
- Activity Log is the record of the day-to-day activities. The Activity Log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

- While evaluating the student's Activity Log, the following shall be considered -
  - a. The individual student's effort and commitment.
  - b. The originality and quality of the work produced by the individual student.
  - c. The student's integration and co-operation with the work assigned.
  - d. The completeness of the Activity Log.
- The assessment for the Community Service Project implementation shall include the following components and based on Weekly Reports.

Outcomes Description:

a. Details of the Socio-Economic Survey of the village/habitation.
b. Problems identified.
c. Community Awareness Programs organized.
e. Suggested Short-Term and Long-Term Action Plan.

B.Tech. V Semester | COURSE CODE: UR20PCEC501

L	T	P	C
3	0	0	3

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Internal Marks: 30
External Marks: 70

Course Objectives:

The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

UNIT – I:

OP-AMP BLOCK DIAGRAM (SYMBOLIC REPRESENTATION): Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slew rate, CMRR, PSRR. Measurements of Op-Amp Parameters, Three-Terminal Voltage Regulators 78xx & 79xx Series, current Booster, adjustable voltage, DualPowerSupplywith78xx&79xx.

UNIT – II:

OP-AMPS APPLICATIONS: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator, Electronic Analog Computation, Monolithic Power Amplifier. Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

UNIT - III:

ACTIVE FILTERS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

UNIT – IV:

TIMERS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.

PHASE LOCKED LOOPS: Introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).

UNIT – V:

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications.

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition 2003.
2. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

REFERENCE BOOKS:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1993.
2. Operational Amplifiers & Linear Integrated Circuits – Sanjay Sharma; SK Kataria&Sons;2nd Edition,2010.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Describe the Op-Amp and internal Circuitry: 555 Timer, PLL.
2. Discuss the Applications of Operational amplifier: 555 Timer, PLL.
3. Design the Active filters using Operational Amplifier.
4. Use the Op-Amp in A to D & D to A Converter.
5. Obtain the knowledge about the types of ADC and DAC converters.
6. Understand of the FM & FSK demodulators.

B.Tech. V Semester	COURSE CODE: UR20PCEC502	L	T	P	C
		3	0	0	3

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concept of electrostatics, electrical potential, energy density and their applications.
3. To impart knowledge on the concept of magneto statics, magnetic flux density, scalar and vector potential and its applications.
4. To impart knowledge on the faraday's law, induced EMF and Maxwell's equation.
5. To impart knowledge on the concepts of electromagnetic waves and transmission lines.

UNIT - I:

REVIEW OF CO-ORDINATE SYSTEMS, ELECTROSTATICS: Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems

UNIT - II:

MAGNETO STATICS: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

UNIT - III:

EM WAVE CHARACTERISTICS: Wave Equations for Conducting and Perfect Dielectric Media Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems. Poynting Vector and Poynting Theorem, Illustrative Problems

UNIT - IV:

TRANSMISSION LINES - I: Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT - V:

TRANSMISSION LINES – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, λ/8, λ/4 and λ /2 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

TEXT BOOKS:

1. Elements of Electromagnetic–Matthew N.O.Sadiku, Oxford Univ. Press, 4thEdition, 2001.
2. Electromagnetic Waves and Radiating Systems – E.C.Jordan and K.G.Balmain, PHI, 2ndEdition, 2000.

REFERENCE BOOKS:

1. Electromagnetic Field Theory and Transmission Lines – G.S.N.Raju, Pearson Education 2006.
2. Engineering Electromagnetic –William H. Hayt Jr. and John A.Buck, TMH, 7th ed., 2006.
3. Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao, WileyIndia2013.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand Phase and Group Velocities.
2. Determine E and H using various laws and applications of electric & magnetic fields.
3. Apply the Maxwell equations to analyse the time varying behaviour of EM waves.
4. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media.
5. Calculate Brewster angle, critical angle and total internal reflection.
6. Derive and calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart.

DIGITAL COMMUNICATIONS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. Understand different pulse digital modulation techniques and their comparison.
2. Familiarize various digital modulation techniques and calculation of their error probabilities.
3. Understand the concept of entropy and different source coding techniques.
4. Familiarize with block codes, cyclic codes and convolution codes

UNIT - I:

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Illustrative Problems.

UNIT - II:

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-array PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT - III:

DATA TRANSMISSION: Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK, Illustrative Problems.

UNIT - IV:

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties, Average information, Entropy and its properties, Information rate, Mutual information and its properties, Illustrative Problems.
SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon- Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth – S/N trade off.

UNIT - V:

CHANNEL CODING: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.
CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications- Simon Haykin, JohnWiley, 2005
2. Digital and Analog Communication Systems –Sam Shanmugam, John Wiley, 2005.

REFERENCE BOOKS:

1. Principles of Communication Systems–H.Tauband D. Schilling, TMH,2003.
2. Digital Communications–John Proakis, TMH, 1983.
3. Communication Systems Analog & Digital– Singh &Sapre, TMH, 2004.
4. Modern Digital and Analog Communication Systems–B.P.Lathi, ZhiDing, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Discuss the concept of Pulse Digital Modulation, performance of different waveform coding techniques for the generation and digital representation of the signals.
2. Familiarize the concepts of different Digital Modulation Techniques; determine the probability of error for various digital modulation schemes.
3. Understand the concept of Data Transmission Techniques.
4. Explain the concept of Information Theory.
5. Describe different source coding techniques.
6. Compute and analyse different error control coding schemes for the reliable transmission of digital information over the channel.

B.Tech. V Semester | COURSE CODE: UR20PEEC504A

L	T	P	C
3	0	0	3

ANTENNAS AND WAVE PROPAGATION

(PE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyse the radiation characteristics of thin wire dipole antennas and solve numerical problems.
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.
3. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.

UNIT - I:

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wires, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT - II:

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of different lengths, Radiation Resistance at a point which is not current maximum, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and Rr relations for small loops.

UNIT - III:

ANTENNA ARRAYS :2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems, Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations, Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

UNIT - IV:

NON-RESONANT RADIATORS: Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT - V:

VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. Introduction to Horn Antennas, Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance – Space Wave Propagation – Mechanism, LOS and Radio Horizon.– Radius of Curvature of path, M-curves and Duct Propagation.

TEXT BOOKS:

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Identify basic antenna parameters.
2. Design and analyse wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas.
3. Quantify the fields radiated by various types of antennas.
4. Design and analyse antenna arrays.
5. Analyse antenna measurements to assess antenna's performance.
6. Identify the characteristics of radio wave propagation.

B.Tech. V Semester **COURSE CODE: UR20PEEC504B**

L	T	P	C
3	0	0	3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(PE-1)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. The objective of the course is to introduce the fundamentals of Electronics Instruments and Measurement providing an in-depth understanding of Measurement errors, Bridge measurements, Digital Storage Oscilloscope, Function Generator and Analyser, Display devices, Data acquisition systems and transducers.
2. To address the underlying concepts and methods behind Electronics measurements.

UNIT - I:

PERFORMANCE CHARACTERISTICS OF INSTRUMENTS, STATIC CHARACTERISTICS: Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Dynamic Characteristics; speed of response, Fidelity, Lag and Dynamic error, Types of errors in measurements and their analysis, Design of multi-range AC, DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True RMS meter.

UNIT - II:

SPECIFICATIONS AND DESIGNING ASPECTS OF SIGNAL GENERATORS:
AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT - III:

OSCILLOSCOPES: General purpose CROs, block diagram, functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs, Measurement of frequency and phase difference using Lissajous patterns Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

UNIT - IV:

BRIDGE CIRCUITS: Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schering Bridge, Wien Bridge, Errors and precautions in using bridges Q-meter, principle of operation, measurement methods and sources of errors Counters: principle of operation -modes of operation- totalizing mode, frequency mode and time period mode-sources of errors.

UNIT - V:

TRANSDUCERS - active & passive transducers: Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

TEXT BOOKS:

1. Electronic instrumentation, second edition-H.S.Kalsi, TataMcGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques– A.D.Helfrickand W.D. Cooper, PHI,5th Edition, 2002.

REFERENCE BOOKS:

1. Electronic Instrumentation & Measurements – DavidA.Bell, PHI, 3rd Edition, 2013.
2. Electrical and electronic measurement and instrumentation – Er.R.K.Rajput by S.Chand.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

At the end of the Course, Student will be able to:
1. Select the instrument to be used based on the requirements.
2. Understand and analyse different signal generators and analysers.
3. Understand the design of oscilloscopes for different applications.
4. Design different transducers for measurement of different parameters.
5. Compare active & passive transducers.
6. Distinguish different bridges.

B.Tech. V Semester | COURSE CODE: UR20PEEC504C

L	T	P	C
3	0	0	3

COMPUTER ARCHITECTURE & ORGANIZATION
(PE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processor design.
4. To explain the function of each element of a memory hierarchy.
5. To identify and compare different methods for computer I/O.

UNIT - I:

BASIC STRUCTURE OF COMPUTERS: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.
MACHINE INSTRUCTION AND PROGRAMS: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types.

UNIT - II:

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions.
TYPE OF INSTRUCTIONS: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT - III:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB), Small Computer System Interface(SCSI).

UNIT - IV:

THE MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory.
CACHE MEMORIES: Mapping Functions, INTERLEAVING.
SECONDARY STORAGE: Magnetic Hard Disks, Optical Disks,

UNIT - V:

PROCESSING UNIT: Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, Fetching. A Word From Memory, Execution of Complete Instruction, Hardwired Control.

MICRO PROGRAMMED CONTROL: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXT BOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5thEdition, McGraw Hill, 2011.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill, 2002.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson, 2012.
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition, 2003.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy, 1998.
5. J .P. Hayes, "Computer Architecture and Organization",McGraw-Hill,1998.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Students can understand the architecture of modern computer.
2. They can analyse the Performance of a computer using performance equation.
3. Understanding of different instruction types.
4. Students can calculate the effective address of an operand by addressing modes.
5. They can understand how computer stores positive and negative numbers.
6. Understand the concepts of I/O Organization and Memory systems.

B.Tech. V Semester	COURSE CODE: ---	L	T	P	C
		3	0	0	3

OPEN ELECTIVE-1

Internal Marks: 30
External Marks: 70

The student can choose any one OE-1 subject offered by other Branches. The list of OEs are available in Course Structure.

B.Tech. V Semester **COURSE CODE: UR20PCEC511**

L	T	P	C
0	0	3	1.5

LINEAR ICs AND APPLICATIONS LAB

Internal Marks: 15
External Marks: 35

COURSE OBJECTIVES:

1. To Gain the practical hands-on experience on 741 Op-Amp applications.
2. To Gain the practical hands-on experience on 555 Timer applications.
3. To Gain the practical hands-on experience on 723 Voltage Regulator and Three terminal voltage regulators.
4. To Gain the practical hands-on experience on IC 565 – PLL Applications.

LIST OF EXPERIMENTS:

MINIMUM TWELVE EXPERIMENTS TO BE CONDUCTED (12 Hardware& 6 Software experiments must be done)

1. Study of ICs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order).
5. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
6. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. Schmitt Trigger Circuits – using IC 741 and IC 555.
11. IC 565 – PLL Applications.
12. IC 566 – VCO Applications.
13. 4 bit DAC using OP AMP.
14. 8X1 Multiplexer– 74151 and 2X4 De-multiplexer- 74155.

EQUIPMENT REQUIRED:

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

SOFTWARE REQUIRED:

Multisim software.

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the basics of Op-Amp and to Design, Analyze Amplifiers, Active filters and Hysteresis voltage of Schmitt trigger using 741 IC.
2. Design the Multivibrator circuits using IC555 and determines the frequency of oscillation and time delay.
3. Explain the functionality of IC723 and determine the load and line regulations.
4. Discuss the characteristics of PLL & design the various applications of PLL.
5. Know IC 566 for VCO Applications.
6. Demonstrate 4 bit DAC using OP AMP.

B.Tech. V Semester | COURSE CODE: UR20PCEC512

L	T	P	C
0	0	3	1.5

DIGITAL COMMUNICATIONS LAB

Internal Marks: 15
External Marks: 35

COURSE OBJECTIVES:

1. This course gives students deep knowledge in digital communication systems all practical level.
2. This lab focuses the fundamental concepts on TDM, pulse modulations, digital modulation, source coding techniques and error – control coding techniques.

LIST OF EXPERIMENTS:

MINIMUM TWELVE EXPERIMENTS TO BE CONDUCTED (12 Hardware& 6 Software experiments must be done):

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Amplitude shift keying
6. Frequency shift keying.
7. Phase shift keying.
8. Differential phase shift keying.
9. Companding.
10. Source Encoder and Decoder.
11. Linear Block Code-Encoder and Decoder.
12. Binary Cyclic Code-Encoder and Decoder.
13. Convolution Code –Encoder and Decoder.
14. BCH Codes.

EQUIPMENT REQUIRED:

1. RPS-0–30V.
2. CRO-0 –20 MHz.
3. FunctionGenerators-0–1MHz.
4. RFGenerators-0–1000M Hz./0–100MHz.
5. Rated Voltmeters and Ammeters.
6. Lab Experimental kits for Digital Communication.
7. Components.
8. Bread boards and Multi-meters.
9. Spectrum Analyzer.

SOFTWARE REQUIRED:

MAT LAB

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the performance of a baseband and pass band digital communication system in terms of error rate and spectral efficiency.
2. Perform the time and frequency domain analysis of the signals in a digital communication system.
3. Analyse Performance of spread spectrum communication system.
4. Verify the error detection and error correction in linear convolution codes.
5. Design and implement analogue to digital converters like PCM, DM.
6. Demonstrate pass band digital demodulation techniques.

B.Tech. V Semester **COURSE CODE: UR20PREC513**

L	T	P	C
0	0	0	1.5

SUMMER INTERNSHIP

Internal Marks: 0
External Marks: 50

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

1. To sensitize the students to the living conditions of the people who are around them.
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems. Implementation of Community Service.

EVALUATION OF THE SUMMER INTERNSHIPS: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programmer. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the college/ JNTUK University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by the Principal.; Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A

student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College. The evaluation guidelines for community service project are given separately.

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 50 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

B.Tech. V Semester | COURSE CODE: UR20SOEC514

L	T	P	C
0	0	4	2

DATA STRUCTURES USING JAVA LAB
(Skill Oriented Course)

Internal Marks: 0
External Marks: 50

COURSE OBJECTIVES:

1. To acquire knowledge on the several data structures like stacks, queues, linked list, trees and graphs.
2. To have better insight linear and nonlinear data structures.
3. To learn various sorting and searching data techniques.
4. To exercise the applications of data structures.
5. To have a good understanding on problem solving using data structure tools and techniques.

LIST OF EXPERIMENTS:

MINIMUM TWELVE EXPERIMENTS TO BE CONDUCTED:

1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:
   (a) Linear search
   (b) Binary search.
2. Write Java programs to implement the List ADT using arrays and linked lists.
3. Write Java programs to implement the following using an array.
   (a) Stack ADT.
   (b) Queue ADT.
4. Write a java program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).
5. Write Java programs to implement the following using a singly linked list.
   (a) Stack ADT.
   (b) Queue ADT.
6. Write Java programs to implement the deque (double ended queue) ADT using:
   (a) Array.
   (b) Doubly linked list.
7. Write a Java program to implement priority queue ADT.
8. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
   (a) Pre order.
   (b) In order and
   (c) Post order.
9. Write a Java program that displays node values in a level order traversal (Traverse the tree one level at a time, starting at the root node) for a binary tree.
10. Write a Java program that uses recursive functions.
    (a) To create a binary search tree.
    (b) To count the number of leaf nodes.

(c) To copy the above binary search tree.

11. Write Java programs for the implementation of BFS and DFS for a given graph.
12. Write Java programs for implementing the following sorting methods:
    (a) Bubble sort
    (b) Selection sort.
13. Write Java programs for implementing the following sorting methods:
    (a) Insertion sort
    (b) Radix sort.
14. Write a Java program for implementing KMP pattern matching algorithm.

NOTE:

1. Skill Oriented Course will be evaluated at the end of the semester for 50 marks (record -15 marks and viva voce -35 marks) along with laboratory end examinations in the presence of external (Appointed by the Principal) and internal examiner (course instructor or mentor).There are no internal marks for the job oriented skill courses.

2. Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Ability to analyse algorithms and determine the time efficiency of each algorithm and their corrections.
2. Master different concepts of abstract data type (ADT), data structures and their implementations.
3. Ability to determine an appropriate algorithm for a particular problem by analysing it.
4. Ability to learn different problem solving techniques in addition to the standard ones.
5. Implement and know the application of algorithms for sorting and pattern matching.
6. Ability to design programs using a variety of data structures such as stacks, queues, hush tables, binary trees, search trees, heaps, graph and B – trees.

B.Tech. V Semester	COURSE CODE: UR20MC501A	L	T	P	C
		0	0	0	0

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Internal Marks: 30
External Marks:00
End Semester Marks: 70

COURSE OBJECTIVES:

1. To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.
2. To make the students understand the traditional knowledge and analyse it and apply it to their day to day life

UNIT – I:

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT – II:

Indian Languages, Culture and Literature: Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India Indian Languages and Literature-II: Northern Indian languages & literature.

UNIT – III:

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV:

Fine Arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT – V:

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TEXT BOOKS:

1. KapilKapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005.
2. "Science in Samskrit", SamskritaBharti Publisher, ISBN 13: 978-8187276333, 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 2004.

REFERENCE BOOKS:

1. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993.
2. SatyaPrakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.
3. M.Hiriyanna,"Essentialsof Indian Philosophy", Motilal Banarsidas Publishers, ISBN 13: 978- 8120810990, 2014

E – RESOURCE:

1. https://www.youtube.com/watch?v=LZP1StpYEPM.
2. http://nptel.ac.in/courses/121106003/

COURSE OUTCOMES:

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

1. Identify the concept of Traditional knowledge and its importance.
2. Understand philosophy of Indian culture.
3. Distinguish the Indian languages and literature.
4. Learn the philosophy of ancient, medieval and modern India.
5. Acquire the information about the fine arts in India.
6. Know the contribution of scientists of different eras.

B.Tech. VI Semester **COURSE CODE: UR20PCEC601**

L	T	P	C
3	0	0	3

MICROPROCESSOR AND MICROCONTROLLERS

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To acquire knowledge on microprocessors and microcontrollers.
2. To select processors based on requirements.
3. To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors.
4. To develop programs efficiently on ARM Cortex processors and debug.

UNIT - I:

INTRODUCTION: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT - II:

8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT – III:

8086 INTERFACING: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, Intel 8257 DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT – IV:

INTEL 8051 MICROCONTROLLER: Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light controls.

UNIT - V:

ARM ARCHITECTURES AND PROCESSORS: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces, Programmers Models, ARM

Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXT BOOKS:

1. A.K Ray, K.M.Bhurchandhi, Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
3. Cortex -M3 Technical Reference Manual.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the internal architecture, organization and assembly language programming of 8086 processors.
2. Design the internal architecture, organization and assembly language programming of 8051controllers.
3. Know the I/O and Memory Interface of 8051 based systems.
4. Understand the Serial Communication and Bus Interface of 8086/8051 based systems.
5. Familiarize the internal architecture of ARM processors.
6. Realize the basic concepts of advanced ARM processors.

B.Tech. VI Semester	COURSE CODE: UR20PCEC602	L	T	P	C
		3	0	0	3

VLSI DESIGN

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyse the behaviour of inverters with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.

UNIT - I:

MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: NMOS, PMOS and CMOS. Ids versus VDS Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BICMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits.

UNIT - II:

CONCEPTS OF BASIC CIRCUITS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT - III:

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT - IV:

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN: static CMOS design: complementary CMOS, rationed logic, pass-transistor logic.

DYNAMIC CMOS DESIGN: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, in stability, Meta stability, multiplexer based

latches, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Storage mechanism, pipelining.

UNIT - V:

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High–k, Metal Gate Technology, Fin-FET, TFET.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems – Kamran Eshraghian, Douglas andA. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by BehzadRazavi, McGraw Hill, 2003.
3. Digital Integrated Circuits, Jan M.Rabaey, Anantha Chandra kasanand Borivoje Nikolic, 2nd edition, 2016.

REFERENCE BOOKS:

1. "Introduction to VLSI Circuits and Systems", John P.Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nano electronics: Nano scale CMOS, Post-CMOS and Allied Nano technologies Vinod Kumar Khanna, Springer India, 1stedition, 2016.
3. Fin-FETs and other multi-gate transistors, Colinge JP, Editor NewYork, Springer, 2008.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
2. Apply the design Rules and draw layout of a given logic circuit.
3. Design basic building blocks in Analog IC design.
4. Analyse the behaviour of amplifier circuits with various loads.
5. Design various CMOS logic circuits for design of Combinational logic circuits.
6. Design various applications using FPGA.

B.Tech. VI Semester	COURSE CODE: UR20PCEC603	L	T	P	C
		3	0	0	3

DIGITAL SIGNAL PROCESSING

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To provide background and fundamental concepts for the analysis and processing of digital signals.
2. To understand the fast computation of DFS and DFT.
3. To design digital filters and their realization structures.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects.

UNIT – I:

INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems , stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT – II:

DISCRETE FOURIER SERIES &FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT and FFT with General Radix-N.

UNIT – III:

DESIGN OF IIR DIGITAL FILTERS& REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT – IV:

DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters, Basic structures of FIR systems, Lattice structures, Lattice-ladder structures.

UNIT – V:

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs ,Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

ARCHITECTURE OF TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move

Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processing – Tarun Kumar Rawat , Oxford University Press India,2015.

REFERENCE BOOKS:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006.
2. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Apply the difference equations concept in the analysis of Discrete time Systems.
2. Use the FFT algorithm for solving the DFT of a given signal.
3. Design a Digital filter (FIR&IIR) from the given specifications.
4. Realize the FIR and IIR structures from the designed digital filter.
5. Use the Multi rate processing concepts in various applications (Eg: Design of phase shifters, interfacing of digital systems.
6. Apply the signal processing concepts on DSP Processor.

B.Tech. VI Semester | COURSE CODE: UR20PEEC604A

L	T	P	C
3	0	0	3

MICROWAVE ENGINEERING
(PE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The student after undergoing this course will be able to explain different types of waveguides and their respective modes of propagation.
2. Analyse typical microwave networks using impedance, admittance, transmission and scattering matrix representations.

UNIT – I:

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode. Related Problems.

MICROSTRIP LINES– Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT – II:

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies, Re-entrant Cavities, Microwave tubes – O type and M type classifications, O-type tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Electronic Admittance; Oscillating Modes and output Characteristics, Electronic and Mechanical Tuning, Applications.

UNIT – III:

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations.

M-TYPE TUBES: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT – IV:

WAVEGUIDE COMPONENTS AND APPLICATIONS - I: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane

types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator, Related Problems.

UNIT – V:

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Mode.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement.

TEXT BOOKS:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering- Annapurna Das and SisirK.Das, McGraw Hill Education, 3rd Edition.
3. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.

REFERENCE BOOKS:

1. Microwave Engineering – G S N Raju , I K International.
2. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Design different modes in waveguide structures.
2. Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction.
3. Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency of devices.
4. Know the various waveguide applications.
5. Measure various microwave parameters using a Microwave test bench.
6. Distinguish microwave sources based on constructional, operational and performance aspects.

B.Tech. VI Semester | COURSE CODE: UR20PEEC604B

L	T	P	C
3	0	0	3

INTERNET OF THINGS
(PE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To understand about the fundamentals of internet of things and its building blocks along with their characteristics.
2. To understand the recent application domains of IOT in everyday life.
3. To understand the protocols and standards designed for IOT and the current research on it.
4. To understand the other associated technologies like cloud and fog computing in the domain of IOT.

UNIT - I:

INTRODUCTION TO IOT: Introduction to IOT Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT - II:

ELEMENTS OF IOT HARDWARE COMPONENTS: Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT - III:

IoT Application Development Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API‟s (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth. Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT - IV:

Solution framework for IoT applications Implementation of Device integration, Data acquisition and integration, Device data storage Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V:

IoT Case Studies IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.
Cloud Analytics for IoT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution

of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.

TEXT BOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2. The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu,2011.
3. Vijay Madisetti, ArshdeepBahga, Internet of Things, "A Hands on Approach", University Press, 2015.

REFERENCE BOOKS:

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand internet of Things and its hardware and software components.
2. IOT application development communication.
3. Interface I/O devices, sensors & communication modules.
4. Remotely monitor data and control devices.
5. Design real time IoT based applications.
6. Data acquisition and integration.

B.Tech. VI Semester | **COURSE CODE: UR20PEEC604C**

L	T	P	C
3	0	0	3

SOFT COMPUTING TECHNIQUES

(PE-2)

Internal marks: 30
External marks: 70

COURSE OBJECTIVES:

1. The main objectives of the course are to expose the students to soft computing, various types of soft computing techniques and applications of soft computing. Upon completion of this course the student should be able to get an idea on.
2. Artificial intelligence, various types of production systems, characteristics of production system.
3. Neural networks, architecture, function and various algorithms involved. Genetic algorithms, it's application and advances.

UNIT - I:

INTRODUCTION: Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems**.**

UNIT - II:

ARTIFICIAL NEURAL NETWORKS: Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.

UNIT - III:

FUZZY LOGIC SYSTEM: Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modeling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modeling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.

UNIT - IV:

GENETIC ALGORITHM: Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant D-colony search techniques for solving optimization problems.

UNIT - V:

APPLICATIONS: GA application to power system optimization problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
3. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
4. Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
5. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
6. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

At the end of this semester, the student able to learn

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem.
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various applications.
6. Integrate various soft computing techniques for complex problems

B.Tech. VI Semester	COURSE CODE: ---	L	T	P	C
		3	0	0	3

OPEN ELECTIVE-2

Internal Marks: 30
External Marks: 70

The student can choose any one OE-2 subject offered by other Branches. The list of OEs are available in Course Structure.

B.Tech. VI Semester **COURSE CODE: UR20PCEC611**

L	T	P	C
0	0	3	1.5

MICROPROCESSOR AND MICROCONTROLLERS LAB

Internal Marks: 15
External Marks: 35

COURSE OBJECTIVES:

1. This course introduces the assembly language programming of 8086 and 8051 microcontroller.
2. It gives a practical training of interfacing the peripheral devices with the 8086 microprocessor.
3. The course objective is to introduce the basic concepts of microprocessor and to develop in the student the assembly language programming skills and real time applications of microprocessor as well as microcontroller.

LIST OF EXPERIMENTS:

PART- A: (Minimum of 5 Experiments has to be performed) 8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
   a. Addition of n-BCD numbers.
   b. Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given n-numbers.
4. Interfacing ADC to8086.
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B: (Minimum of 5 Experiments has to be performed) 8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number.
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051.
6. Interfacing LCD to8051.

PART – C: (Minimum of 2 Experiments has to be performed) Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integer's numbers.
3. Write a program to toggle LED every second using timer interrupt.

EQUIPMENT REQUIRED:

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

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand and apply the fundamentals assembly level programming of microprocessors and microcontroller.
2. Work with standard microprocessor real time interfaces including GPJO serial ports, digital – to – analog converts and analog - to - digital converts.
3. Troubleshoot interactions between software and hardware.
4. Analyse abstract problems and apply a combination of hardware and software to address and problem.
5. Use standard test and measurement equipment to evaluate digital interfaces.
6. To programme the timers and counters by using 8051.

B.Tech. VI Semester **COURSE CODE: UR20PCEC612**

L	T	P	C
0	0	3	1.5

VLSI DESIGN LAB

Internal Marks: 15
External Marks: 35

COURSE OBJECTIVES:

1. Apply the concepts of basic combinational logic circuits, sequential circuit elements and programmable logic in the laboratory setting.
2. To develop familiarity and confidence with designing. Building and testing digital circuits including the use of CAD tools.
3. Behavioural register transfer logic and physical – level structured VLSI design using CAD tools and hardware description language.

LIST OF EXPERIMENTS:

PART (A):

FPGA LEVEL IMPLEMENTATION (ANY SEVEN EXPERIMENTS)

NOTE 1: The students need to develop Verilog /VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer.
NOTE 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory.

DESIGN AND IMPLEMENTATION OF THE FOLLOWING:

1. Realization of Logic gates.
2. 4-bit ripple carry and carry look ahead adder using behavioural, dataflow and structural modelling.
3. **a.)** 16:1 MUX through 4:1 MUX.
   b.) 3:8 decoder realization through 2:4 decoder
4. 8:3 encoder
5. 8-bit parity generator and checker
6. Flip-Flops
7. 8-bit synchronous up-down counter
8. 4-bit sequence detector through Mealy and Moore state machines.

EDA TOOLS/HARDWARE REQUIRED:

- EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
- Desktop computer with appropriate Operating System that supports the EDA tools.

PART (B):

BACK-END LEVEL DESIGN AND IMPLEMENTATION (ANY FIVE EXPERIMENTS):

NOTE: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.

DESIGN AND IMPLEMENTATION OF THE FOLLOWING:

1. Universal Gates.
2. An Inverter
3. Full Adder
4. Full Subtractor
5. Decoder
6. D-Flip-flop

EDA TOOLS/HARDWARE REQUIRED:

- Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
- Desktop computer with appropriate Operating System that supports the EDA tools.

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Write HDL code for basic as well as advanced digital integrated circuits.
2. Import the logic modules into FPGA Boards.
3. Ability to design the logic circuits.
4. Synthesize, place and Route the digital IP's.
5. Design, implement and simulate circuits using VHDL.
6. Design, simulate and extract the layouts of anlaog IC blocks using EDA tools.

B.Tech. VI Semester **COURSE CODE: UR20PCEC613**

L	T	P	C
0	0	3	1.5

DIGITAL SIGNAL PROCESSING LAB

Internal Marks: 15
External Marks: 35

COURSE OBJECTIVES:

1. To implement linear and circular convolution.
2. To implement FIR and IIR filters.
3. To study the architecture of DSP processor.

(**NOTE:** Students have to perform at least FOUR experiments from each part.)

PART - A:

LIST OF EXPERIMENTS

1. Generation of DT signals.
2. Verify the Linear Convolution of two DT signals
   a) Using MATLAB
   b) Using Code Composer Studio (CCS)
3. Verify the Circular Convolution of two DT signals
   a) Using MATLAB
   b) Using Code Composer Studio (CCS)
4. Find the sum of DT sinusoidal signals.
5. Computation of Discrete Fourier Transform (DFT) and Inverse. Discrete Fourier Transform (IDFT)
   a) Using MATLAB.
   b) Using Code Composer Studio (CCS)
6. Transfer Function Stability Analysis: using pole-zero plot, bode Plot and Nyquist plot.

PART - B:

Following Experiments are to be done using a TIDSP Starter Kit.

7. Generation of a sinusoidal signal.
8. Linear and circular convolution of DT sequences.
9. Compute N-point DFT of a given DT sequence.
10. Design and implementation of FIR filters.
11. Design and implementation of IIR filters.

PART - C:

Following Experiments are to be done using Cypress FM 4 Starter Kit.

12. Verification of sampling theorem.
13. Implementation of FFT algorithm.
14. Implementation of FIR filters.
15. Implementation of IIR filters.

NOTE: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOME:

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

1. Experiment concepts of DSP and its application using mat lab software.
2. To understand about the basic signal generation.
3. To learn Fourier transforms concepts.
4. To design FIR filters.
5. To design IIR filters.
6. Demonstrate their abilities towards DSP processor based implementation of DSP system.

B.Tech. VI Semester **COURSE CODE: UR20SOEC614**

L	T	P	C
1	0	2	2

ARM BASED/ ARDUINO BASED PROGRAMMING/IoT
(Skill Oriented Course)

Internal Marks: 0
External Marks: 50

COURSE OBJECTIVES:

1. An embedded system is a combination of hardware and software provided that both should be synchronized with each other.
2. Some examples are as follows: industrial machines, automobiles, medical equipment, cameras, household applications, airplanes, vending machines etc.
3. The aurdino is an open – source computer hardware/software platform for building devices and interactive objects that can sense and control the physical world around them.
4. In this course students will learn how the Arduino platform works in terms of the physical board and libraries and IDE (Integrated development environment).
5. The course will also cover programming the Arduino using C code and accessing the pins on the board via the software to control external devices.

LIST OF EXPERIMENTS:

1. Introduction to Raspberry Pi Board/ Arduino/Node MCU.
2. Familiarization with ARM keil MDK for programming and debugging an application on the PSoC 4 BLE chip and perform necessary software installation.
3. Measure Analog signal from Temperature Sensor.
4. Generate PWM output.
5. Drive single character generation on Hyper Terminal.
6. Drive a given string on Hyper Terminal.
7. Full duplex Link establishment using Hyper terminal.
8. Drive a given value on a 8 bit DAC consisting of SPI.
9. Drive Stepper motor using Analog GPIOs.
10. Drive Accelerometer and Display the readings on Hyper Terminal.
11. Automatic street light control to control the street light (Turn on and off based on the light) using Arduino.
12. Detecting obstacle with IR Sensor and Arduino.
13. Write an Arduino program for interfacing Arduino board with the Ultrasonic sound sensor.
14. To interface DC motor using Arduino.

COMPONENTS/ BOARDS:

1. Arduino Duemilanove Board.

2. Arduino Software IDE.

NOTE:

1. Skill Oriented Course will be evaluated at the end of the semester for 50 marks (record -15 marks and viva voce -35 marks) along with laboratory end examinations in the presence of external (Appointed by the Principal) and internal examiner(course instructor or mentor).There are no internal marks for the job oriented skill courses.

2. Minimum 12 experiments must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105085/

COURSE OUTCOMES:

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

1. Comprehend Microcontroller-Transducers Interface techniques.

2. Establish Serial Communication link with Arduino.

3. Analyse basics of SPI interface.

4. Interface Stepper Motor with Arduino.

5. Analyse Accelerometer interface techniques.

6. Measuring the temperature values from sensors

B.Tech. VI Semester | COURSE CODE: UR20MC600C

L	T	P	C
0	0	0	0

CONSTITUTION OF INDIA

Internal Marks: 30
External Marks:00
End Semester Marks: 70

COURSE OBJECTIVES:

1. To enable the student to understand the importance of constitution.
2. To understand the structure of executive, legislature and judiciary.
3. To understand philosophy of fundamental rights and duties.
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

UNIT - I:

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

UNIT - II:

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

UNIT - III:

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

UNIT - IV:

Local Administration - District's Administration Head - Role and Importance, Municipalities – Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: FunctionsPRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials – Importance of grass root democracy

UNIT - V:

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

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd..NewDelhi.
2. SubashKashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government & Politics

REFERENCE BOOKS:

1. D.C. Gupta, Indian Government and Politics.
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
3. J.C. Johari, Indian Government and Politics Hans.
4. J. Raj Indian Government and Politics.
5. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi.
6. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E – RESOURCES:

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

COURSE OUTCOMES:

At the end of the course students will be able to

1. Understand historical background of the constitution making and its importance for building a democratic India.
2. Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.
4. Analyse the decentralization of power between central, state and local self-government.
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
6. Know the sources, features and principles of Indian Constitution.

B.Tech. VII Semester	COURSE CODE: UR20PEEC701A	L	T	P	C
		3	0	0	3

OPTICAL COMMUNICATION
(PE-3)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To learn the basic elements of optical fiber transmission link, fiber modes, configurations and structures.
2. To understand the different kind of losses, signal distortion, SM fibers.
3. To learn the various optical sources, materials and optical fiber splicing.
4. To learn the fiber optical receivers and noise performance in photo detector.

UNIT – I:

OVERVIEW OF OPTICAL FIBER COMMUNICATION- Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

UNIT - II:

FIBER MATERIALS:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave- guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber, Related problems.

UNIT - III:

OPTICAL FIBER CONNECTORS: -Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT – IV:

OPTICAL SOURCES: - LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems.

UNIT – V:

SOURCE TO FIBER POWER LAUNCHING:– Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

OPTICAL SYSTEM DESIGN:– Point – to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. OpticalFiber Communications – Gerd Keiser, McGraw-Hill International edition, 3rd Edition, 2000.
2. OpticalFiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

RERFERENCE BOOKS:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Choose necessary components required in modern optical communications systems.
2. Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers.
3. Use different types of photo detectors and optical test equipment to analyse optical fiber and light wave systems.
4. Choose the optical cables for better communication with minimum losses.
5. Design, build, and demonstrate optical fiber experiments in the laboratory.
6. Understand the Optical system design.

B.Tech. VII Semester	COURSE CODE: UR20PEEC701B	L	T	P	C
		3	0	0	3

DIGITAL IMAGE PROCESSING
(PE-3)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques.
3. To study image restoration procedures.
4. To study the image compression procedures.

UNIT – I:

INTRODUCTION: -Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

IMAGE TRANSFORMS: -Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms

UNIT - II:

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods.

FILTERING IN THE FREQUENCY DOMAIN: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering, implementation.

UNIT – III:

IMAGE RESTORATION AND RECONSTRUCTION:A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction from projections.

UNIT – IV:

IMAGE COMPRESSION: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding. Wavelet coding

WAVELETS AND MULTIRESOLUTION PROCESSING: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

UNIT – V:

IMAGE SEGMENTATION: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.

COLOR IMAGE PROCESSING: Color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

REFERENCE BOOKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.DuttaMajumder, "Digital Image Processing and Analysis", PHI, 2009.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

Course Outcomes:

After undergoing the course students will be able to

1. Perform image manipulations and different digital image processing techniques.
2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
3. Image compression techniques.
4. Analyse pseudo and full colour image processing techniques.
5. Apply various morphological operators on images.
6. Image segmentation and colour image processing.

B.Tech. VII Semester	COURSE CODE: UR20PEEC701C	L	T	P	C
		3	0	0	3

LOW POWER VLSI DESIGN
(PE-3)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To provide basic knowledge of low voltage device modelling.
2. To provide over view of voltage, low power VLSI CMOS circuit design.

UNIT - I:

SOURCES OF POWER DISSIPATION: Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Sub threshold Leakage Current, Short-Channel Effects.

UNIT - 2:

SUPPLY VOLTAGE SCALING FOR LOW POWER: Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling.

UNIT - 3:

SWITCHED CAPACITANCE MINIMIZATION: Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization.

UNIT - 4:

LEAKAGE POWER MINIMIZATION: Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management.

UNIT - 5:

LOW POWER CLOCK DISTRIBUTION& SIMULATION POWER ANALYSIS: Low power clock distribution: Power dissipation in clock distribution, single

driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network.

SIMULATION POWER ANALYSIS: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation
Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS:

1. Low-Power VLSI Circuits and Systems, Ajit Pal, Springer Publishers
2. Practical Low Power Digital Vlsi Design, Gary Yeap Motorola, Springer Science+Business Media, Llc.

REFERENCE BOOKS:

1. Low Power CMOS Design – AnanthaChandrakasan, IEEE Press/Wiley International, 1998.
2. MassoudPedram, Jan M. Rabaey , "Low power design methodologies ", Kluwer Academic Publishers.
3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies.
2. Students able to understand deep submicron CMOS technology and digital CMOS design styles.
3. To design chips used for battery-powered systems and high performance circuits.
4. Learn the design of various CMOS dynamic logic circuits.
5. Learn the design techniques low voltage and low power CMOS circuits for various applications.
6. Learn the different types of memory circuits and their design.

B.Tech. VII Semester	COURSE CODE: UR20PEEC702A	L	T	P	C
		3	0	0	3

SATELLITE COMMUNICATIONS
(PE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To enable the student to become familiar with satellite and satellite services.
2. Study of satellite orbits and launching.
3. Study of earth segment and space segment components.
4. Study of satellite access by various users.

UNIT – I:

INTRODUCTION: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT – II:

SATELLITE SUB SYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

UNIT – III:

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT – IV:

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Inter modulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, link design using TDMA, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.

EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

UNIT – V:

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and

codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.
3. Digital satellite communication by TRI T HA …..TMH.

REFERENCE BOOKS:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004.
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the concepts, applications and subsystems of Satellite communications.
2. Understand the orbital mechanics and launchers.
3. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
4. Understand the various types of multiple access techniques and architecture of earth station design.
5. Understand the concepts of GPS and its architecture.
6. Understand the geostationary satellite systems.

B.Tech. VII Semester	COURSE CODE: UR20PEEC702B	L	T	P	C
		3	0	0	3

EMBEDDED SYSTEMS
(PE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies in tune with the requirements of industry.
2. The objectives of this course are to enable the students to understand embedded system programming and apply that knowledge to design and develop embedded system.

UNIT - I:

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT – II:

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III:

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT – IV:

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization. Device drivers

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co- Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

UNIT - V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, De-assembler/ De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

CASE STUDY: digital camera hardware and software architecture, embedded systems in automobile, embedded system for a smart card, mobile phone software for key inputs.

TEXT BOOKS:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.

REFERENCE BOOKS:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-LylaB.Das-Pearson Publications,2013.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the basic concepts of an embedded system.
2. Know an embedded system design approach to perform a specific function.
3. The hardware components required for an embedded system and the design approach of an embedded hardware.
4. The various embedded firmware design approaches on embedded environment.
5. Understand how to integrate hardware and firmware of an embedded system using real time operating system.
6. Various types of files generated on cross-compilation.

B.Tech. VII Semester	COURSE CODE: UR20PEEC702C	L	T	P	C
		3	0	0	3

DIGITAL IC DESIGN USING CMOS
(PE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. Basics of MOS technology and its operation in enhancement and depletion modes, Basic electrical properties of MOS, threshold voltage and body effects and design of MOS inverters with different loads.
2. Basic logic gates with CMOS such as NAND, NOR, AOI, OAI gates, transmission gate logic circuits and BICMOS inverter.
3. The design of D flip-flop using transmission gates and the design of NOR and NAND based ROM memory.

UNIT – I:

MOS DESIGN: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT – II:

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates , AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT – III:

SEQUENTIAL MOS LOGIC CIRCUITS: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT – IV:

DYNAMIC LOGIC CIRCUITS: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT – V:

INTERCONNECT: Capacitive Parasitic, Resistive Parasitic, Inductive Parasitics, and Advanced Interconnect Techniques.

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.

DESIGNING MEMORY AND ARRAY STRUCTURES: Introduction, Memory Classification, Memory Architectures and Building Blocks, The Memory Core,

Read Only Memories, Non-volatile Read-Write Memories, Read-Write Memories (RAM), Contents Addressable or Associative Memory (CAM), Memory Peripheral Circuitry, The Address Decoders, Sense Amplifiers, Voltage References, Drivers/Buffers, Timing and Control.

TEXT BOOKS:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

REFERENCE BOOKS:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the concepts of MOS Design.
2. Design and analysis of Combinational MOS Circuits.
3. Design and analysis of Sequential MOS Circuits.
4. Extend the Digital IC Design to Different Applications.
5. Design and analysis of dynamic logic MOS Circuits.
6. Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

B.Tech. VII Semester	COURSE CODE: UR20PEEC703A	L	T	P	C
		3	0	0	3

RADAR ENGINEERING
(PE-5)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the principles of operation of various blocks of radar systems and radar range equation in detail.
2. To study the functions of various blocks of CW radar, FM-CW radar, MTI and pulse Doppler radars, tracking radar and their limitations and applications.
3. To study the functions of various blocks and radar receivers and detection of radar signals in noise in detail.
4. To study the principles and working of phased array antennas and their application to radar systems.

UNIT – I:

BASICS OF RADAR: Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems

RADAR EQUATION : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT – II:

CW AND FREQUENCY MODULATED RADAR : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems.

FM-CW RADAR: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT - III:

MTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Nth Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT – IV:

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two-coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT –V:

DETECTION OF RADAR SIGNALS IN NOISE: Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

RADAR TRANSMITTERS & RECEIVERS–Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes Modulators, solid state.

TEXT BOOK:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS:

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013.
4. Radar Engineering – GSN Raju, IK International.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Derive the radar range equation and to solve some analytical problems.
2. Understand the different types of radars and its applications.
3. Understand the concept of tracking and different tracking techniques.
4. Understand the various components of radar receiver and its performance.
5. Understand the radar range equation.
6. Understand the detection of radar signals in noise.

B.Tech. VII Semester	COURSE CODE: UR20PEEC703B	L	T	P	C
		3	0	0	3

PATTERN RECOGNITION & MACHINE LEARNING
(PE-5)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The main objective of this course is to enable the student with basic knowledge on the techniques to build an intellectual machine for making decisions behalf of humans.
2. This course covers the techniques on how to make learning by a model. how it can be evaluated, what are all different algorithms to construct a learning model.

UNIT – I:

INTRODUCTION TO PATTERN RECOGNITION: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bays rule, discriminate functions, loss functions and Bayesian error analysis

UNIT - II:

LINEAR MODELS: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

UNIT - III:

NEURAL NETWORK: perception, multi-layer perception, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Adboost, Deep Learning

UNIT - IV:

LINEAR DISCRIMINATE FUNCTIONS: - decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

UNIT – V:

ALGORITHM INDEPENDENT MACHINE LEARNING: – lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers.

UNSUPERVISED LEARNING AND CLUSTERING: – k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", 2nd Edition John Wiley & Sons,2001.
2. Machine learning by SaikatDutt, S. Chandramouli and A.K.DasPearso publishing, 2018.

REFERENCE BOOKS:

1. C. Bishop, "Pattern Recognition and Machine Learning", Springer,2006.
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, "The Elements of Statistical Learning", 2nd Edition, Springer,2009.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Study the parametric and linear models for classification.
2. Understand the linear models.
3. Design neural network and SVM for classification.
4. Develop machine independent and unsupervised learning techniques.
5. Linear discriminate functions.
6. Linear programming algorithms.

B.Tech. VII Semester	COURSE CODE: UR20PEEC703C	L	T	P	C
		3	0	0	3

MOBILE & CELLULAR COMMUNICATION
(PE-5)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
2. To provide the student with an understanding of Co-channel and Non-Co-channel interferences.
3. To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
4. To give the student an understanding of frequency management, Channel assignment and types of handoff.

UNIT – I:

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System,Limitations of Conventional System, Performance characteristics of cellular systems, Basic Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT – II:

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co-channel interference- different types.

UNIT – III:

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and Grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, antenna height gain, form of a point to point model.

UNIT – IV:

HANDOFF STRATEGIES:
Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.

UNIT – V:

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA.3G and 4G Wireless Standards GSM , GPRS , WCDMA , LTE , Wi-MAX, Introduction to 5G standards.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.
3. Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley& Sons Publication 2nd Edition.

REFERENCES BOOKS:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn.,2002.
2. Fundamentals of Wireless Communication By. David Tse and PramodViswanath, Cambridge University Press.

E – RESOURCE:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

At the end of the Course, Student will be able to:
1. Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
2. Understand the types of interferences.
3. Understand the frequency management, channel assignment strategies and antennas in cellular systems.
4. Understand the cell coverage for signal and traffic.
5. Understand the concepts of handoff and architectures of various cellular systems.
6. Understand the digital cellular networks.

B.Tech. VII Semester	COURSE CODE: ---	L	T	P	C
		3	0	0	3

OPEN ELECTIVE-3

Internal Marks: 30

External Marks: 70

The student can choose any one OE-3 subject offered by other Branches. The list of OEs are available in Course Structure.

B.Tech. VII Semester	COURSE CODE: ---	L	T	P	C
		3	0	0	3

OPEN ELECTIVE-4

Internal Marks: 30
External Marks: 70

The student can choose any one OE-4 subject offered by other Branches. The list of OEs are available in Course Structure.

B.Tech. VII Semester	COURSE CODE: UR20HS706	L	T	P	C
		3	0	0	3

UNIVERSAL HUMAN VALUES -II: UNDERSTANDING HARMONY

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clar it y) of the harmony in the human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.
5. Understanding of Harmony on Professional Ethics

UNIT - I:

NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE:
Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority , Understanding Happiness and Prosperity correctly, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT - II:

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

UNIT -III:

UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP
Understanding values in human- human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding he meaning of Trust ; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT - IV:

UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS COEXISTENCE

Understanding the harmony in the Nature Inter connectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space Holistic perception of harmony at all levels of existence.

UNIT - V:

IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability t o 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 transit ion 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:

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

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa

E – RESOURCES:

1. https://nptel.ac.in/courses/109104068
2. https://www.uhv.org.in/

COURSE OUTCOMES:

By the end of the course, students are expected to

1. Become more aware of themselves, and their surroundings (family, society, nature).
2. Become more responsible in life.
3. Handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
4. Better critical ability.
5. Become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
6. Apply what they have learnt to their own self in different day-to-day.

B.Tech. VII Semester	COURSE CODE: UR20SOEC711	L	T	P	C
		1	0	2	2

DESIGNER TOOLS

(HFSS, Microwave Studio CST. Cadence Virtuoso. Synopsys, Mentor Graphics, Xilinx, Robotic simulation software)

(Skill Oriented Course)

Internal Marks: 0
External Marks: 50

COURSE OBJECTIVES:

1. To perform functional verification, synthesize, implementation and Analysis of various combinational and sequential circuits.
2. Design and simulate different types of Antennas.

LIST OF EXPERIMENTS:

PART- A: Cadence Virtuoso. Synopsys, Mentor Graphics, Xilinx, Tanner EDA, Robotic simulation software (Minimum of 8 Experiments has to be performed).

1. Booths Multiplier (4-Bit Multiplier) (Xilinx).
2. Pseudo Random Binary Sequence (4-Bit) (Xilinx).
3. Design Of Sequence Detector (Xilinx).
4. Design Of Ripple Carry ADDER Using Verilog HDL.
5. Design Of Carry Save Adder Using Verilog HDL.
6. Design Of Carry Select Adder Using Verilog HDL.
7. BCD Adder Realization In Verilog HDL.
8. Array Multiplier Realization In Verilog HDL.
9. Design of Accumulator.
10. Design Of Carry Save Adder Using Verilog HDL.
11. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR. [DIFFERENTIAL AMPLIFER (Tanner EDA)].
12. To design and plot the output characteristics of a 3-inverter ring oscillator. [Ring Oscillator (Tanner EDA)].
13. Analysis of Frequency response of Common source amplifiers. [Common Source Amplifier (Tanner EDA)].
14. Analysis of Frequency response of Common drain amplifiers. [Common Drain Amplifier (Tanner EDA)].
15. To design and plot the characteristics of a 4x1 digital multiplexer using pass transistor logic. (4x1 digital multiplexer using pass transistor logic (Tanner EDA)].

PART- B: HFSS/ Microwave Studio CST Experiments: (Minimum of 2 Experiments has to be performed)

1. Design and Analyse of Rectangular Microstrip patch Antenna.
2. Design and Analyse of Microstrip Dipole Antenna.
3. Design of Log-Periodic Antenna.
4. Radiation Pattern of Three Element Yagi-Uda Antenna.

PART- C: ROBOTICS Experiments: (Minimum of 2 Experiments has to be performed)

1. Obstacle detection Robot
2. Landmine detection Robot
3. Line follower Robot

NOTE:

1. Skill Oriented Course will be evaluated at the end of the semester for 50 marks (record -15 marks and viva voce -35 marks) along with laboratory end examinations in the presence of external (Appointed by the Principal) and internal examiner(course instructor or mentor).There are no internal marks for the job oriented skill courses

2. Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

COURSE OUTCOMES:

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

1. Design of Sequence Detector.
2. Analysis of Frequency response of Common drain amplifiers.
3. Measure gain, ICMR, and CMRR of differential amplifier.
4. Design of Carry Select Adder Using Verilog HDL.
5. Analyse, design and simulate Antennas for various applications
6. Able to detect obstacles using Robot

B.Tech. VII Semester **COURSE CODE: UR20PREC712**

L	T	P	C
0	0	0	3

INDUSTRIAL / RESEARCH INTERNSHIP

2 Months (Mandatory) after third year (to be evaluated during VII semester)

Internal Marks: 0
External Marks: 50

COURSE OBJECTIVES:

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

1. To sensitize the students to the living conditions of the people who are around them.
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems. Implementation of Community Service.

EVALUATION OF THE SUMMER INTERNSHIPS: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programmer. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the college/ JNTUK University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by the Principal.; Head of the Department, supervisor of the internship and a senior faculty member of the department. A

certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College. The evaluation guidelines for community service project are given separately.

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 50 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

B.Tech. VII Semester	COURSE CODE: UR20MC700B	L	T	P	C
		0	0	0	0

RESEARCH METHODOLOGY AND IPR

Internal Marks: 30
External Marks:00
End Semester Marks: 70

COURSE OBJECTIVES:

1. To understand the objectives and characteristics of a research problem.
2. To analyse research related information and to follow research ethics
3. To understand the types of intellectual property rights.
4. To learn about the scope of patent rights.
5. To understand the new developments in IPR.

UNIT – I:

RESEARCH PROBLEM: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT – II:

LITERATURE STUDY: Effective literature studies approaches, analysis Plagiarism, Research ethics,
Technical writing: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT – III:

NATURE OF INTELLECTUAL PROPERTY: Patents, Designs, Trade and Copyright.
PROCESS OF PATENTING AND DEVELOPMENT: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT – IV:

PATENT RIGHTS: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT – V:

NEW DEVELOPMENTS IN IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

REFERENCES BOOKS:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
2. Mayall, "Industrial Design", McGraw Hill, 1992.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

E – RESOURCES:

1.https://onlinecourses.nptel.ac.in/noc22_ge08/preview
2.https://nptel.ac.in/courses/121106007

COURSE OUTCOMES:

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

1. Explain the objectives and characteristics of a research problem.
2. Analyse research related information and to follow research ethics.
3. Understand the types of intellectual property rights.
4. Learn about the scope of IPR.
5. Discuss the new developments in IPR.
6. know research ethics, scholarly publishing

B.Tech. VIII Semester	COURSE CODE: UR20PREC801	L	T	P	C
		0	0	0	12

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY

Internal Marks: 60
External Marks: 140

SYLLABUS CONTENTS:

The project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The project should have the following

1. Relevance to social needs of society.
2. Relevance to value addition to existing facilities in the institute.
3. Relevance to industry need.
4. Problems of national importance.
5. Research and development in various domain.

The student should complete the following in project.

1. Literature survey Problem Definition.
2. Motivation for study and Objectives.
3. Preliminary design / feasibility / modular approaches.
4. Implementation and Verification.
5. Report and presentation

GUIDELINES FOR PROJECT:

1. As per the AICTE directives, the project is a yearlong activity, to be carried out and evaluated in two stages i.e. VIII Semester.
2. The project may be carried out preferably in-house i.e. department's laboratories and centres OR in industry allotted through department's T & P coordinator.
3. After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define project objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
4. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and stage wise work distribution, and submit the proposal within a month from the date of registration.
5. A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, a record of continuous progress.

6. A committee comprising of guides of respective specialization shall assess the progress/performance of the student based on report, presentation and Q &A. In case of unsatisfactory performance, committee may recommend repeating the Stage-I work.

7. Major Project (Project - Project work, seminar and internship in industry): In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner. Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the Principal and is evaluated for 140 marks.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Synthesize knowledge and skills previously gained.
2. Apply an in-depth study and execution of new technical problem.
3. Select from different methodologies, methods.
4. Form analysis to produce a suitable research design, and justify their design.
5. Present the findings of their technical solution in a written report.
6. Present the work in International/ National conference or reputed journals.

OPEN ELECTIVES OFFERED

BY

ECE DEPARTMENT

B.Tech. V Semester | COURSE CODE: UR20OEEC505A

L	T	P	C
3	0	0	3

BASIC ELECTRONICS
(OE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. This course provides the student with the fundamental skills to understand the basic of semiconductor and components like diode, transistor, FET, MOSFET and operational amplifier.
2. It will built mathematical background for design of electronic circuits and component value.
3. Students equipped with the knowledge and training provided in the course will be able to participate in design, development and operation in the different area of electronics systems.

UNIT – I:

SEMICONDUCTOR BASICS: Atomic Structure, Semiconductors, Conductors, and Insulators, Covalent Bonds, Conduction in Semiconductors, N-Type and P- Type Semiconductors, Diode, Biasing a Diode, Voltage-Current Characteristic of a Diode, Diode Models.
Diode Applications: Half- Wave Rectifiers, Full-Wave Rectifiers, Power Supply Filters and Regulators.

UNIT – II:

SPECIAL-PURPOSE DIODES: Zener Diodes, Zener Diode Applications, Varactor Diodes, Optical Diodes

UNIT – III:

BIPOLAR JUNCTION TRANSISTORS: Transistor Structure, Basic Transistor Operation, Transistor Characteristics and Parameters, Transistor as an Amplifier and Switch

UNIT - IV:

FIELD-EFFECT TRANSISTORS (FETS): JFET, Characteristics and Parameters, JFET Biasing, MOSFET Characteristics and Parameters

UNIT - V:

THYRISTER AND OTHER DEVICES: Basic 4-Layer Device, The Silicon-Controlled Rectifier, SCR Applications, Uni-junction Transistor, IGBT, Phototransistor, Light-Activated SCR, Optical Couplers

TEXT BOOK:

1. Electronic Devices conventional current version By Floyd, Seventh Edition, Pearson publications.

REFERENCE BOOKS:

1. Electronics devices & circuit theory- Robert L.Boylestad and LouiNashelsky, Pearson/Prentice hall, tenth edition, 2009.
2. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, SecondEdition,2007.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
2. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
3. Understand the construction, principle of operation of transistors.
4. To study basics of semiconductor & devices and their applications in different areas.
5. Compare design issues, advantages, disadvantages and limitations of basic electronics.
6. To study different biasing techniques to operate transistor, FET, MOSFET and operational amplifier in different modes.

B.Tech. V Semester | COURSE CODE: UR20OEEC505B

L	T	P	C
3	0	0	3

BASICS OF SIGNALS AND SYSTEMS
(OE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. This Course trains students for an intermediate level of fluency with signals.
2. systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, communication theory and system theory, control robotics.

UNIT – I:

INTRODUCTION: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.

UNIT – II:

TIME-DOMAIN REPRESENTATIONS FOR LTI SYSTEMS: Convolution, impulse response representation, Convolution Sum and Convolution Integral. Properties of impulse response representation, Differential and difference equation Representations, Block diagram representations.

UNIT - III:

FREQUENCY-DOMAIN REPRESENTATION FOR SIGNALS: Introduction, Discrete-time and continuous-time Fourier series (derivation of series excluded) and their properties. Discrete-time and continuous-time Fourier transforms (derivations of transforms are excluded) and their properties.

UNIT - IV:

APPLICATIONS OF FOURIER REPRESENTATIONS: Introduction, Frequency response of LTI systems, Fourier transform representation of periodic signals, Fourier transform representation of discrete time signals.

UNIT - V:

LAPLACE &Z-TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.

Z-TRANSFORMS: Introduction, Z-transform, properties of ROC, properties of Z – transforms, inversion Z-transforms. Z-Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations.

TEXT BOOKS:

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, "Signals and Systems", Pearson, 2nd Edn.
2. B. P. Lathi, "Linear Systems and Signals", Second Edition, Oxford University Press, Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition.

REFERENCE BOOKS:

1. Michel J. Robert, "Fundamentals of Signals and Systems", MGH International Edition, 2008.
2. Ramakrishna Rao,"Signals and Systems", 2008, TMH.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand linear time invariant systems.
2. Apply the concepts of Fourier series representations to analyse continuous and discrete time periodic signals.
3. Understand and apply the continuous time Fourier transform, discrete time Fourier transform.
4. Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems.
5. Analyse the sampling process and sampling of discrete time signals.
6. Analyse discrete time signals and systems by using appropriate mathematical tools.

B.Tech. V Semester | COURSE CODE: UR20OEEC505C

L	T	P	C
3	0	0	3

DIGITAL LOGIC DESIGN
(OE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binary codes.
2. To study the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques.
3. To study the combinational logic design of various logic and switching devices and their realization.

UNIT – I:

REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De-morgan theorems, Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX- NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.

UNIT – II:

MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine- mccluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III:

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI: Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits .Realization of Boolean functions using decoders and multiplexers, Design of Priority encoder, 4-bit digital comparator and seven segment decoder. Study the relevant ICs pin diagrams and their functions 7442, 7447, 7485, 74154.

INTRODUCTION OF PLD's: PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV:

SEQUENTIAL CIRCUITS I: Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop, Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register, Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V:

SEQUENTIAL CIRCUITS II: Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa, Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K. Jha 3rdEdition, Cambridge UniversityPress,2009.
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHI publication,2008.
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H.RothJr,Jaico Publishers, 2006.
2. Digital electronics by RSSedha. S.Chand& company limited, 2010.
3. Switching Theory and Logic Design by A.AnandKumar, PHI Learning pvt ltd, 2016.
4. Digital logic applications and design by John MYarbough ,Cengage learning, 2006.
5. TTL74-Seriesdatabook.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions.
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters.
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
6. Produce innovative designs by modifying the traditional design techniques.

COURSE CODE: UR20OEEC505D

B.Tech. V Semester

L	T	P	C
3	0	0	3

CONSUMER ELECTRONICS
(OE-1)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The student will learn about troubleshoot different types of microphones and speakers.
2. To study the troubleshoot colour TV receivers.
3. To maintain the various consumer electronics appliances.

UNIT - I:

AUDIO SYSTEMS: Microphones and Loudspeakers: Carbon, moving coil, cordless microphone, Direct radiating and horn loudspeaker, Multi-speaker system, Hi-Fi stereo and dolby system. Concept to fidelity, Noise and different types of distortion in audio system

UNIT - II:

DIGITAL AUDIO FUNDAMENTALS: Audio as Data and Signal, Digital Audio Processes Outlined, Time Compression and Expansion.

UNIT - III:

TELEVISION: Basics of Television: Elements of TV communication system, Scanning and its need, Need of synchronizing and blanking pulses, VSB, Composite Video Signal, Colour Television: Primary, secondary colours, Concept of Mixing, Colour Triangle, Camera tube, PAL TV Receiver, NTSC, PAL, SECAM

UNIT - IV:

DIGITAL TRANSMISSION AND RECEPTION: Digital satellite television, Direct-To-Home(DTH) satellite television, Introduction to :Video on demand, CCTV, High Definition(HD)-TV. Introduction to Liquid Crystal and LED Screen Televisions Basic block diagram of LCD and LED Television and their comparison

UNIT- V:

INTRODUCTION TO DIFFERENT TYPE OF DOMESTIC/COMMERCIAL APPLIANCES: Operation of Micro-wave oven, Food Processors, Digital Electronic Lock, Vacuum cleaner, Xerox Machine, Scanner.

TEXT BOOKS:

1. Modern Television Practice by R. R. Gulai; New Age International Publishers.
2. Audio Video Systems by R. G. Gupta; McGraw Hill Education System.
3. Audio Video Systems Principles Practices and Troubleshooting by Bali & Bali; Khanna Publishing Company.
4. Consumer Electronics by S. P. Bali; Pearson Education, New Delhi

REFERENCE BOOKS:

1. Modern Television practices by Gulati R.R., New Age International Publication (P) Ltd. New Delhi Year 2011, latest edition.
2. Audio video systems by Gupta R.G., Tata Mcgraw Hill, New Delhi, India 2010, , latest edition.
3. Mastering Digital Television by Whitaker Jerry & Benson Blair, McGraw-Hill Professional, 2010, latest edition.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the various type of microphones and loud speakers.
2. To identify the various digital and analog signal.
3. Describe the basis of television and composite video signal.
4. Describe the various kind of colour TV standards and system.
5. Compare the various types of digital TV system.
6. Understand the various type of consumer goods.

B.Tech. VI Semester | COURSE CODE: UR20OEEC605A

L	T	P	C
3	0	0	3

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(OE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The objectives of the course is to introduce the fundamentals of electronics instruments and measurements providing an in-depth understanding of measurement error bridge measurements, Digital storage oscilloscope, function generator and analyser , display devices, data acquisition systems and transducers.
2. To address the underlying concepts and methods behind electronics measurements.

UNIT - I:

PERFORMANCE CHARACTERISTICS OF INSTRUMENTS, STATIC CHARACTERISTICS: Accuracy, Resolution, Precision, Expected value, Error, Sensitivity, Dynamic Characteristics, speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis, Design of multi-range AC , DC meters (voltmeter &ammeter) and ohmmeter(series &shunt type) using D'arsonval movement. True rms meter.

UNIT - II:

SPECIFICATIONS AND DESIGNING ASPECTS OF SIGNAL GENERATORS:– AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT - III:

OSCILLOSCOPES: - general purpose CROs; block diagram , functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns, Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope

UNIT - IV:

BRIDGE CIRCUITS: - Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge, Measurement of capacitance-Schearing Bridge. Wien Bridge, Errors and precautions in using bridges, Q-meter; principle of operation, measurement methods and sources of errors, Counters: principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.

UNIT - V:

TRANSDUCERS: - active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers. Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement

TEXT BOOKS:

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. HelfrickandW.D. Cooper, PHI, 5th Edition, 2002.

REFERENCE BOOKS:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. DhanpatRai& Co, 12thEdition,2002.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Select the instrument to be used based on the requirements.
2. Understand and analyse different signal generators and analysers.
3. Understand the design of oscilloscopes for different applications.
4. Design different transducers for measurement of different parameters.
5. Understand and analyse the bridge circuits.
6. Understand the different types of elements in the electronics.

B.Tech. VI Semester | COURSE CODE: UR20OEEC605B

L	T	P	C
3	0	0	3

PRINCIPLES OF COMMUNICATIONS
(OE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the fundamental concepts of analog communication systems.
2. To analyze the various analog modulation and demodulation techniques.
3. To know the working of various transmitters and receivers.
4. To understand the influence of noise on the performance of analog communications systems.
5. To acquire the knowledge about information and capacity.

UNIT – 1:

AMPLITUDE MODULATION: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

SINGLE SIDE–BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT – II:

ANGLE MODULATION: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

UNIT – III:

SIGNAL SAMPLING AND ANALOG PULSE COMMUNICATION: Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation. Digital Communication Techniques: Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Pulse Code Modulation, Delta Modulation.

UNIT – IV:

NOISE IN ANALOG MODULATION: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre- emphasis and De-emphasise in FM.

UNIT – V:

TRANSMISSION OF BINARY DATA IN COMMUNICATION SYSTEMS: Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction

TEXT BOOKS:

1. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication,2006.

REFERENCE BOOKS:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Analyze the performance of analog modulation schemes in time and frequency domains.
2. Analyze the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise.
4. Characterize the influence of channel on analog modulated signals.
5. Determine the performance of analog communication systems in terms of SNR.
6. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

B.Tech. VI Semester | COURSE CODE: UR20OEEC605C

L	T	P	C
3	0	0	3

INDUSTRIAL ELECTRONICS
(OE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
2. To understand the operation of single phase full–wave converters and analyze harmonics in the input current.
3. To study the operation of three phase full–wave converters.
4. To understand the operation of different types of DC-DC converters.
5. To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
6. To analyze the operation of AC-AC regulators.

UNIT – I:

DC AMPLIFIERS: Need for DC amplifiers, DC amplifiers - Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers - Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT – II:

REGULATED POWER SUPPLIES: Block diagram, Principle of voltage regulation, Series and Shunt type Linear Voltage Regulators, Protection Techniques - Short Circuit, Over voltage and Thermal Protection. Switched Mode & IC Regulators: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators - Current boosting.

UNIT – III:

SCR AND THYRISTER: Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors - Classes A, B, C, D, E and F, Ratings of SCR.

UNIT – IV:

APPLICATIONS OF SCR IN POWER CONTROL: Static circuit breaker, Protection of SCR, Inverters - Classification, Single Phase inverters, Converters –single phase Half wave and Full wave. DIAC, TRIAC and Thyristor Applications: Chopper circuits – Principle, methods and Configurations, DIAC AND TRIAC, TRIACS – Triggering modes, Firing Circuits, Commutation.

UNIT – V:

INDUSTRIAL APPLICATIONS – I: Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital timers, Time base Generators. Electric Welding Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control.

INDUSTRIAL APPLICATIONS – II: High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics – Generation and Applications.

TEXT BOOKS:

1. Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2. Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972.

REFERENCE BOOKS:

1. Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edn., 2003.
2. Thyristors and applications – M. Rammurthy, East-West Press, 1977.
3. Integrated Circuits and Semiconductor Devices – Deboo and Burroughs,ISE.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the concept of DC amplifiers.
2. Analyze and design different voltage regulators for real time applications.
3. Describe the basis of SCR and Thyristor.
4. Determine the performance of DIAC and TRIAC.
5. Develop real time application using electronics.
6. Will learn how electronic components are used in the industry.

B.Tech. VI Semester | COURSE CODE:UR20OEEC605D

L	T	P	C
3	0	0	3

FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS (OE-2)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To provide the solid foundation on the fundamentals of microprocessors and applications.
2. Interfacing the external devices to the processor according to the user requirements thus, enabling to create novel products and solutions for real time problems.

UNIT – I:

8085 PROCESSOR: Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts, Interrupts.
8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration

UNIT – II:

8086 PROGRAMMING: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT – III:

8086 INTERFACING: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT – IV:

8051 MICRO CONTROLLER: Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts– Timing Diagram — Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT – V:

MICRO CONTROLLER PROGRAMMING & APPLICATIONS: Simple programming exercises- key board and display interface –Control of servo motor stepper motor control- Application to automation systems.

TEXT BOOKS:

1. R.S. Gaonkar, Microprocessor Architecture Programming and Application, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2. A.K Ray, K.M.Bhurchandhi," Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000.
3. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition, 2011.

REFERENCE BOOKS:

Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the architecture of microprocessor/microcontroller and their operation.
2. Demonstrate programming skills in assembly language for processors and controllers.
3. Analyze various interfacing techniques and apply them for the design of processor/Controller based systems.
4. Competent with the on chip peripherals of microcontrollers.
5. Design different interfacing applications using microcontrollers and peripherals.
6. Build systems using microcontrollers for real time applications.

B.Tech. VII Semester **COURSE CODE: UR20OEEC704A**

L	T	P	C
3	0	0	3

IC APPLICATIONS
(OE-3)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. This subject introduces the theoretical & circuit aspects of OP-amp, timer and logic gates, which are the backbone for the basics of linear and digital integrated circuit.
2. To understand the various linear & non-linear applications of OP-amp also, learn various digital IC's and circuits which are highly performed in day to day commercial and household devices.

UNIT - I:

Ideal and Practical Op-Amp, Op-amp characteristics-DC and AC Characteristics, General Linear Applications of Op-Amp: Adder, Subtractor, Differentiators and Integrators, Active Filters and Oscillators, Non linear Applications of OPAMP: Comparators, Schmitt Trigger, and Multivibrators.

UNIT - II:

Introduction to 555 Timer, Functional Diagram, Monostable and Astable Operations and Applications, Schmitt Trigger, PLL- Introduction, Block Schematic, Principles and Description of individual Blocks of 565, VCO.

UNIT - III:

Introduction, Basic DAC Techniques - Weighted Resistor Type. R-2R Ladder Type, inverted R-2R Type. Different types of ADCs - Parallel Comparator Type. Counter Type. Successive Approximation Register Type and Dual Slope Type DAC and ADC Specifications.

UNIT - IV:

Use of TTL-74XX Series & CMOS 40XX Series ICs, TTL ICs - Code Converters, Decoders, Demultiplexers, Encoders, Priority Encoders, multiplexers & their applications. Priority Generators, Arithmetic Circuit ICs-Parallel Binary Adder/Subtractor Using 2's Complement System, Magnitude Comparator Circuits.

UNIT - V:

Commonly Available 74XX & CMOS 40XX Series ICs - RS, JK.JK Master-Slave. D and T Type Flip-Flops & their Conversions, Synchronous and asynchronous counters. Decade counters. Shift Registers & applications.

TEXT BOOKS:

1. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p)Ltd, 3" Ed., 2008.

2. Digital Fundamentals - Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCE BOOKS:

1. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.

2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/

2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Learn about the basic concepts for the circuit configuration for the design of linear integrated circuits and develop skills to solve engineering problems.

2. Develop skills to design linear and non-linear applications circuits using OP-amp.

3. Develop skills to design the active filters circuits.

4. Gain knowledge about PLL, and develop the skills to design the simple circuits using IC-555 timer and can solve problems related to it.

5. Acquired the knowledge about the CMOS logic, combinational and sequential circuits.

6. Learn about various techniques to develop A/D and D/A converters.

B.Tech. VII Semester	COURSE CODE: UR20OEEC704B	L	T	P	C
		3	0	0	3

TRANSDUCERS AND SENSORS
(OE-3)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To make students familiar with the construction and working principle of different types of sensors and transducers.
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.

UNIT – I:

MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS: Measurements – Basic method of measurement – Generalized scheme for measurement systems – Units and standards – Errors – Classification of errors, error analysis – Statistical methods – Sensor – Transducer – Classification of transducers – Basic requirement of transducers.

UNIT – II:

CHARACTERISTICS OF TRANSDUCERS: Static characteristics – Dynamic characteristics – Mathematical model of transducer – Zero, first order and second order transducers – Response to impulse, step, ramp and sinusoidal inputs.

UNIT – III:

RESISTIVE TRANSDUCERS: Potentiometer –Loading effect – Strain gauge – Theory, types, temperature compensation – Applications – Torque measurement – Proving Ring – Load Cell – Resistance thermometer – Thermistors materials – Constructions, Characteristics – Hot wire anemometer

UNIT – IV:

INDUCTIVE AND CAPACITIVE TRANSDUCER: Self inductive transducer – Mutual inductive transducers – Linear Variable Differential Transformer – LVDT Accelerometer – RVDT – Synchros – Microsyn – Capacitive transducer – Variable Area Type – Variable Air Gap type – Variable Permittivity type – Capacitor microphone.

UNIT- V:

MISCELLANEOUS TRANSDUCERS: Piezoelectric transducer – Hall Effect transducers – Smart sensors – Fiber optic sensors – Film sensors – MEMS – Nano sensors, Digital transducers.

TEXT BOOKS:

1. Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 18th Edition, DhanpatRai& Company Private Limited, 2007.
2. Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.

REFERENCE BOOKS:

1. Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.
2. Doebelin. E.A, "Measurement Systems – Applications and Design", Tata McGraw Hill, New York, 2000.
3. John. P, Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000. 4. Murthy. D. V. S, "Transducers and Instrumentation", Prentice Hall of India, 2001.
4. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
5. Instrument Transducers – An Introduction to their Performance and design – by Herman K. P. Neubrat, Oxford University Press.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Use concepts in common methods for converting a physical parameter into an electrical quantity.
2. Classify and explain with examples of transducers, including those for measurement of temperature, strain, motion, position and light.
3. Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc.
4. Predict correctly the expected performance of various sensors.
5. Locate different type of sensors used in real life applications and paraphrase their importance.
6. Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers.

B.Tech. VII Semester	COURSE CODE: UR20OEEC704C	L	T	P	C
		3	0	0	3

DATA COMMUNICATIONS
(OE-3)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To understand the basic concepts of data communications.
2. To learn the layered architecture of communication protocols.
3. To learn digital signal transmission and encoding techniques.
4. To learn multiplexing techniques.

UNIT - I:

INTRODUCTION TO DATA COMMUNICATIONS: Components, Data Representation, Data Flow, Networks- Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture.

UNIT - II:

DATA LINK LAYER: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT - III:

THE NETWORK LAYER: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet- Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6

UNIT - IV:

TRANSPORT LAYER: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP - UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented

Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to Congestion Control

UNIT - V:

APPLICATION LAYER: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

REFERENCE BOOKS:

1. Data communication and Networks - BhusanTrivedi, Oxford university press, 2016.
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education, 2003.
3. Understanding Communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning, 2003.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Able to identify the various definitions for data communications and networking and how they are used in the communications industry.
2. Know the Categories and functions of various Data communication Networks.
3. Design and analyse various error detection techniques.
4. Demonstrate the mechanism of routing the data in network layer.
5. Know the significance of various Flow control and Congestion control Mechanisms.
6. The student will be able to identify the different types of communications media and the advantages and disadvantages of each and explain the differences among servers and clients.

B.Tech. VII Semester	COURSE CODE: UR20OEEC704D	L	T	P	C
		3	0	0	3

BIO MEDICAL INSTRUMENTATION
(OE-3)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. This course is designed for biomedical engineering undergraduate students.
2. The purpose of this course is to provide biomedical instrumentation background on technical aspects.
3. Biomedical measurements systems are introduced in detail. Students are provided with overviews of the major physical techniques that used to explore in biomedical engineering levels.

UNIT – I:

SOURCES OF BIOELECTRIC POTENTIALS AND ELECTRODES: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, introduction to bio-medical signals.

UNIT – II:

THE CARDIOVASCULAR SYSTEM: The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds, Event detection, PQRS & T-Waves in ECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.

UNIT - III:

PATIENT CARE & MONITORY AND MEASUREMENTS IN RESPIRATORY SYSTEM: The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.

UNIT - IV:

BIO TELEMETRY AND INSTRUMENTATION FOR THE CLINICAL LABORATORY: - Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.

UNIT – V:

X- RAY AND RADIOISOTOPE INSTRUMENTATION AND ELECTRICAL SAFETY OF MEDICAL EQUIPMENT: - Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic resonance Imaging System, Ultrasonic Imaging System, Medical Thermography

TEXT BOOK:

1. Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A.Pfeiffer – Pearson education.
2. Biomedical signal analysis – Rangaraj, M. Rangayya – Wiley Inter science – John willey& Sons Inc.

REFERENCE BOOKS:

1. Hand Book of Bio-Medical Instrumentation – R.S. Khandpur, (TMH)
2. Introduction to Bio-Medical Engineering – Domach, (Pearson)
3. Introduction to Bio-Medical Equipment Technology – Cart, (Pearson).

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Apply principles and concepts of electronics to analyze input and output signals in medical electronics.
2. Apply principles and concepts of electronics to design filters for de-noising of medical measurements.
3. Recognize different types of transducers, ongoing progress in improving their design, and their application in medical measurements.
4. Apply principles and concepts of engineering to quantify and model measurements of bio potentials.
5. Apply principles and concepts of sensing and engineering to (i) design diagnostic devices for detection of markers in biofluids, and (ii) be able to evaluate quality of diagnostic devices.
6. Apply engineering tools to evaluate parameters needed for point-of-care health screening and mobile-health, and design of appropriate point-of-care diagnostic devices

B.Tech. VII Semester	COURSE CODE: UR20OEEC705A	L	T	P	C
		3	0	0	3

IOT AND APPLICATIONS
(OE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. Students will be explored to the interconnection of the physical world and the cyber space.
2. The students are able to design & develop IOT devices.

UNIT - I:

INTRODUCTION TO IOT: Introduction to IOT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IOT Technology Fundamentals- Devices and gateways, Data management, Business processes in IOT, Everything as a Service (XAAS), Role of Cloud in IOT, Security aspects in IOT.

UNIT - II:

ELEMENTS OF IOT: Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT - III:

IOT APPLICATION DEVELOPMENT: Communication, IOT Applications, Sensing, Actuation, I/O interfaces.
Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, COAP, UDP, TCP, Bluetooth.

BLUETOOTH SMART CONNECTIVITY: -Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT - IV:

SOLUTION FRAMEWORK FOR IOT APPLICATIONS: Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V:

IOT CASE STUDIES: IOT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation. Cloud Analytics for IOT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IOT, Connecting IOT to cloud, Cloud Storage for IOT Challenge in integration of IOT with Cloud.

TEXT BOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu, 2011.
3. Vijay Madisetti, ArshdeepBahga, Internet of Things, "A Hands on Approach", UniversityPress,2015

REFERENCE BOOKS:

1. Cypress Semiconductor/PSoC4BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Rajand Anupama C.Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand the basics of IOT.
2. Understand internet of Things and its hardware and software components.
3. Interface I/O devices, sensors & communication modules.
4. Remotely monitor data and control devices.
5. Design real time IOT based applications.
6. Understand the control devices.

B.Tech. VII Semester	COURSE CODE: UR20OEEC705B	L	T	P	C
		3	0	0	3

REMOTE SENSING AND GIS
(OE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. Apply the concepts of photogrametry and its applications such as determination of heights of objects on terrain.
2. Understand the basic concepts of remote sensing and know about different types of satellite and sensors.
3. Illustrate energy interactions with atmosphere and with earth surface features, interpretation.
4. Understand different components of GIS and learning about map projection and coordinate system.

UNIT – I:

INTRODUCTION TO PHOTOGRAMMETRY: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II:

REMOTE SENSING: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False colour composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III:

GEOGRAPHIC INFORMATION SYSTEMS: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters

UNIT – IV:

VECTOR DATA MODEL: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V:

RASTER DATA MODEL: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data. Data Input: Metadata,
Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015.

REFERENCE BOOKS:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter ABurragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Retrieve the information content of remotely sensed data.
2. Analyse the energy interactions in the atmosphere and earth surface features.
3. Interpret the images for preparation of thematic maps.
4. Apply problem specific remote sensing data for engineering applications
5. Analyse spatial and attribute data for solving spatial problems.
6. Create GIS and cartographic outputs for presentation.

B.Tech. VII Semester	COURSE CODE: UR20OEEC705C	L	T	P	C
		3	0	0	3

SOFT COMPUTING TECHNIQUES
(OE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. The main objectives of the course are to expose the students to soft computing, various types of soft computing techniques and applications of soft computing. Upon completion of this course the student should be able to get an idea on.
2. Artificial intelligence, various types of production systems, characteristics of production system.
3. Neural networks, architecture, function and various algorithms involved.
4. Genetic algorithms, it's application and advances.

UNIT – I:

INTRODUCTION TO SOFT COMPUTING: Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy systems, Genetic Algorithm and Evolutionary programming, Swarm Intelligent systems, Expert systems, Comparison among Intelligent systems.

UNIT –II:

ARTIFICIAL NEURAL NETWORKS: Introduction to Artificial Neural Networks, Classification of ANNS, First generation neural networks, Perceptron network, Adaline, Madaline, Second generation neural networks, Back propagation neural networks, Hopfield Neural Network, Kohonen neural network, Hamming neural network, Radial basis function neural networks, spike neuron models.

UNIT – III:

FUZZY LOGIC SYSTEM: Introduction to fuzzy logic, classical sets and fuzzy sets, fuzzy set operations, fuzzy relations, fuzzy composition, natural language and fuzzy interpretations, fuzzy inference system, fuzzy controllers

UNIT – IV:

GENETIC ALGORITHM: Introduction to Genetic algorithms, Genetic algorithms, procedures of Gas, working of Gas, Travelling sales man problem, Evolutionary programming, working principle of GA Machine learning classifier system

UNIT – V:

SWARM INTELLIGENT SYSTEM: Introduction to swarm intelligence, back ground, Ant colony system, working of ant colony optimization, Particle swarm intelligent systems, artificial bee colony system, cuckoo search algorithm.

TEXT BOOKS:

1. Soft computing with MATLAB programming—N.P.Padhy, S.P.Simon, Oxford university press, 2015
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
3. Introduction to Artificial Neural Systems-Jacek.M.Zurada, Jaico Publishing House,1999

REFERENCE BOOKS:

1. Fuzzy Sets, Uncertainty and Information - Klir G.J. &Folger T.A., Prentice-Hall of IndiaPvt. Ltd., 1993.
2. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3. Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4. Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5. Elements of Artificial Neural Networks - KishanMehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
7. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem.
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various application.
6. Integrate various soft computing techniques for complex problems.

B.Tech. VII Semester	COURSE CODE: UR20OEEC705D	L	T	P	C
		3	0	0	3

PRINCIPLES OF SIGNAL PROCESSING
(OE-4)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. This course is designed to give students the required knowledge for DFT & FFT and its computation.
2. Understand the design techniques for digital fibers.

UNIT - I:

DISCRETE SIGNALS AND SYSTEMS:- A Review – Introduction to DFT – Properties of DFT – Circular Convolution – Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

UNIT - II:

Structures of IIR filters – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation.

UNIT - III:

STRUCTURES OF FIR FILTERS: – Linear phase FIR filter – Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques

UNIT - IV:

MULTIRATE SIGNAL PROCESSING: Basic building blocks of multirate DSP, Decimation, Interpolation, Sampling rate conversion by a rational factor, Multistage Sampling Rate Converters.

UNIT - V:

ADAPTIVE FILTERS: Introduction, LMS and RLS Adaptation Algorithms, Applications of adaptive filtering to equalization, noise cancellation.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI

REFERENCE BOOKS:

1. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
2. Understanding Digital Signal Processing 2nd Edition by Richard G.Lyons.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Use the FFT algorithm for solving the DFT of a given signal.
2. Design a Digital filter (FIR&IIR) from the given specifications.
3. Realize the FIR and IIR structures from the designed digital filter.
4. Use the Multirate Processing concepts in various applications.
5. Apply the Adaptive signal processing concepts to various signal processing applications.
6. Perform time, frequency and z-transform analysis on signals and systems

MINOR COURSES OFFERED

BY

DEPARTMENT OF ECE

B.Tech. Minor Degree	COURSE CODE: UR20MDEC01	L	T	P	C
		3	1	0	4

PRINCIPLES OF ELECTRONIC DEVICES AND CIRCUITS
(Minor Degree)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To learn and understand the basic concepts of semiconductor physics.
2. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4. Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.

UNIT - I:

REVIEW OF SEMICONDUCTOR PHYSICS: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

JUNCTION DIODE CHARACTERISTICS : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT - II:

SPECIAL SEMICONDUCTOR DEVICES: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT,PN-PN Diode, SCR. Construction, operation and V-I characteristics.

RECTIFIERS AND FILTERS: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits- operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter(Stunt inductor), π- Filter, comparison of various filter circuits in terms of ripple factors.

UNIT - III:

TRANSISTOR CHARACTERISTICS:
BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers - Moll model of a transistor, punch through/reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, gm, RD parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- IV:

TRANSISTOR BIASING AND THERMAL STABILIZATION : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in VBE, IC and β, Stability factors,(S,S',S''), Bias compensation, Thermal runaway, Thermal stability.
FET Biasing - methods and stabilization.

UNIT - V:

SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER MODELS: BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS:

1. Electronic Devices and Circuits-J.Millman, C.Halkias, TataMc-GrawHill, Second Edition, 2007.
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics devices & circuit theory-Robert L.Boylestad and LouiNashelsky, Pearson / Prenticehall, tenthedition, 2009.

REFERENCE BOOKS:

1. Integrated Electronics-J. Millman, C.Halkias,TataMc-Graw Hill, Second Edition,2009.
2. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications.
3. Electronic Devices and Circuits - Salivahanan, Kumar, Vallavaraj, TataMc-Graw Hill, 4thEdition, 2008.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Apply the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p- n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with the V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
6. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations

B.Tech. Minor Degree	COURSE CODE: UR20MDEC02	L	T	P	C
		3	1	0	4

PRINCIPLES OF DIGITAL ELECTRONICS
(Minor Degree)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binary codes.
2. To study the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques.
3. To study the combinational logic design of various logic and switching devices and their realization.

UNIT – I:

REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.

UNIT – II:

MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine- mcCluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder - subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams.

UNIT – III:

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI: Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuit's .Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. Study the relevant ICs pin diagrams and their functions 7442, 7447, 7485, 74154.

INTRODUCTION OF PLD's: PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV:

SEQUENTIAL CIRCUITS I: Classification of sequential circuits (synchronous and asynchronous), operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bidirectional shift register, universal shift, register. Study the following relevant ICs and their relevant functions 7474, 7475, 7476, 7490, 7493, 74121.

UNIT – V:

SEQUENTIAL CIRCUITS II: Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice -versa.Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rd Edition, Cambridge University Press,2009.
2. Digital Design by M.Morris Mano, Michael D Ciletti,4th edition PHI publication,2008.
3. Switching theory and logic design by Hill and Peterson**,** Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006.
2. Digital electronics by R S Sedha. S.Chand& company limited,2010
3. Switching Theory and Logic Design by A.Anand Kumar, PHI Learning pvt ltd, 2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning, 2006.
5. TTL 74-Series data book.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Classify different number systems and apply to generate various codes.
2. Use the concept of Boolean algebra in minimization of switching functions.
3. Design different types of combinational logic circuits.
4. Apply knowledge of flip-flops in designing of Registers and counters.
5. The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
6. Produce innovative designs by modifying the traditional design techniques.

COURSE CODE: UR20MDEC03 | **L** | **T** | **P** | **C**

B.Tech. Minor Degree

3 | **1** | **0** | **4**

PRINCIPLES OF COMMUNICATIONS
(Minor Degree)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To study the fundamental concepts of analog communication systems.
2. To analyze the various analog modulation and demodulation techniques.
3. To know the working of various transmitters and receivers.
4. To understand the influence of noise on the performance of analog communications systems.
5. To acquire the knowledge about information and capacity.

UNIT - I:

AMPLITUDE MODULATION: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

SINGLE SIDE - AND VESTIGIAL SIDE BAND METHODS OF MODULATION: SSB Modulation, VSB Modulation, Frequency Translation, Frequency - Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television.

UNIT - II:

ANGLE MODULATION: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing.

PHASE–LOCKED LOOP: Non - linear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super-heterodyne Receiver.

UNIT - III:

RANDOM VARIABLES & PROCESS: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of auto correlation function, Cross–correlation functions.

NOISE:ShotNoise,Thermalnoise,WhiteNoise,NoiseEquivalentBandwidth,NoiseFi gure.

UNIT - IV:

NOISE IN ANALOG MODULATION: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre- emphasis and De-emphasis in FM.

UNIT - V:

DIGITALREPRESENTATIONOFANALOGSIGNALS: IntroductionWhyDigitizeAnalogSources?,TheSampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise.

PULSE CODE MODULATION: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH,2007, 3rd Edition.
2. Communication Systems–B.P.Lathi, BS Publication,2006.

REFERENCE BOOKS:

1. Principles of Communication Systems – Simon Haykin, John Wiley, 2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH2004.
3. Communication Systems–R.P. Singh, SP Sapre, Second Edition TMH, 2007.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Analyse the performance of analog modulation schemes in time and frequency domains.
2. Analyse the performance of angle modulated signals.
3. Characterize analog signals in time domain as random processes and noise.
4. Characterize the influence of channel on analog modulated signals.
5. Determine the performance of analog communication systems in terms of SNR.
6. Analyse pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

B.Tech. Minor Degree	COURSE CODE: UR20MDEC04	L	T	P	C
		3	1	0	4

FUNDAMENTALS OF SIGNAL AND SYSTEMS
(Minor Degree)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. This Course trains students for an intermediate level of fluency with signals and systems.
2. Both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, communication theory and system theory, control robotics.

UNIT - I:

INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude shifting, amplitude - scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT - II:

FOURIER ANALYSIS OF PERIODIC SIGNALS: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum.

UNIT - III:

FOURIER ANALYSIS OF APERIODIC SIGNALS: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

UNIT - IV:

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation.

SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.

UNIT - V:

LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z-transforms.

REFERENCE BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2ndEdn,1997.

E – RESOURCES:

1. https://nptel.ac.in/courses/111/107/111107105/
2. https://nptel.ac.in/courses/111/105/111105123/

COURSE OUTCOMES:

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

1. Understand linear time invariant systems.
2. Apply the concepts of Fourier series representations to analyse continuous and discrete time periodic signals.
3. Understand and apply the continuous time Fourier transform, discrete time Fourier transform.
4. Apply the concepts of Laplace transform, and z-Transform to the analysis and description of LTI continuous and discrete-time systems.
5. Analyse the sampling process and sampling of discrete time signals.
6. Analyse discrete time signals and systems by using appropriate mathematical tools

B.Tech. Minor Degree **COURSE CODE: ----**

L	T	P	C
0	0	0	2

MOOC/NPTEL COURSE-I
(Minor Degree)

A student shall be permitted to pursue up to a maximum of two elective courses under MOOCS during the programme. Students are advised to register only for minimum 12 weeks in duration MOOCS courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAYAM/NPTEL through online with the approval of head of the department in order to earn the 3 credits. The head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCS courses registered by the students shall be submitted to the college examination section. The head of the department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of hod and shall be passed.

PROCEDURE FOR CONDUCT AND EVALUATION OF MOOC: there shall be a discipline centric elective course through massive open online course (MOOC) as program elective course. The student shall register for the course (minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of head of the department. The head of the department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alernative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of hod and shall be passed.

B.Tech. Minor Degree	COURSE CODE: ----	L	T	P	C
		0	0	0	2

MOOC/NPTEL COURSE-II

(Minor Degree)

A student shall be permitted to pursue up to a maximum of two elective courses under MOOCS during the programme. Students are advised to register only for minimum 12 weeks in duration MOOCS courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAYAM/NPTEL through online with the approval of head of the department in order to earn the 3 credits. The head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCS courses registered by the students shall be submitted to the college examination section. The head of the department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

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