SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

(Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi and Accredited by NBA, NAAC)
Sheriguda Village, Ibrahimpatnam Mandal, Ranga Reddy Dist. – 501 510

BACHELOR OF TECHNOLOGY
ELECTRONICS & COMMUNICATION ENGINEERING

CHOICE BASED CREDIT SYSTEM (CBCS)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI FOR

I, II, III & IV YEARS – I & II SEMESTERS

UNDER AUTONOMOUS STATUS FOR THE BATCHES ADMITTED FROM

THE ACADEMIC YEAR 2020 – 21

B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2020–21)
&
B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2021 - 22)

Note: The regulations here under are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

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Vision of the Institute

To be a Premier Institution in Engineering & Technology and Management for Competency, Values and Social Consciousness

Mission of the Institute

IM_1: Provide high quality academic programs, training activities and research facilities.

IM_2: Promote continuous industry – institute interaction aimed at promoting employability, entrepreneurship, leadership and research aptitude among stakeholders

IM_3: Contribute the economic and technological development of the region, state and Nation.

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Vision of the Department

To be a centre of excellence in Electronics and Communication Engineering Education to produce professionals for ever-growing needs of society.

Mission of the Department

DM_1: To promote and facilitate student-centric learning.

DM_2: To involve in activities that enable overall development of stakeholders.

DM_3: To provide holistic environment with state-of-art facilities for students to develop solutions for various social needs.

DM_4: Organize trainings in Embedded Systems with Industry interaction.

PROGRAM OUTCOMES (POs):

PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design / Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs):

PSO1	**Basic Electronic and communications knowledge:** Apply basic knowledge related to electronic circuits, VLSI, communication systems, signal processing and embedded systems to solve engineering/societal problems.
PSO2	**Design Methods:** Design, verify and authenticate electronic functional elements for different applications, with skills to interpret and communicate results.
PSO3	**Experimentation & Communications:** Engineering and management concepts are used to analyze specifications and prototype electronic experiments/projects either independently or in teams.

Program Educational Objectives (PEOs):

PEO1	**Higher Degrees & Professional Employment:** Graduates with ability to pursue career in core industries or higher studies in reputed institution.
PE02	**Domain Knowledge:** Graduates with ability to apply professional knowledge/ skills to design and develop product or process.
PEO3	**Engineering Career:** Graduates with excellence in Electronics and Communication Engineering along with effective inter-personnel skills.
PEO4	**Lifelong Learning:** Graduates equipped with skills in recent technologies and be receptive to attain professional competence through life-long learning.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

ACADEMIC REGULATIONS 2020 (BR20) FOR CHOICE BASED CREDIT SYSTEM (CBCS)
B.TECH. DEGREE COURSES

(Applicable for Students admitted from the academic year 2020-2021)

PRELIMINARY DEFINITIONS AND NOMENCLATURES

- "Autonomous Institute / College" means an institute / college designated as autonomous institute / college by the UGC, New Delhi and JNTUH Statutes, 2014.
- "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs granted by the University for promoting excellence.
- "Commission" means University Grants Commission (UGC), New Delhi.
- "AICTE" means All India Council for Technical Education.
- "University" means the Jawaharlal Nehru Technological University, Hyderabad.
- "College" means SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY, Hyderabad unless indicated otherwise by the context.
- "Programme" means: Bachelor of Technology (B.Tech) degree programme
- "Branch" means specialization in a programme like B.Tech degree programme in Electronics and Communication Engineering, B.Tech degree programme in Computer Science and Engineering etc
- "Course" or "Subject" means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester. For example, R20MTH1101: Mathematics - I, R20CSE1101 : Programming for Problem Solving etc.
- T – Tutorial, P – Practical, D – Drawing, L - Theory, C – Credits

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

ACADEMIC REGULATIONS 2020 (BR20) FOR CHOICE BASED CREDIT SYSTEM (CBCS) B.TECH. DEGREE COURSES

(Applicable for Students admitted from the academic year 2020-2021)

1 Courses of study

The following courses of study (Branches) are offered at present by the college with specialization in the B. Tech. Course:

Sl. No.	Branch Code	Branch
1	1	CIVIL ENGINEERING
2	2	ELECTRICAL & ELECTRONICS ENGINEERING
3	3	MECHANICAL ENGINEERING
4	4	ELECTRONICS & COMMUNICATION ENGINEERING
5	5	COMPUTER SCIENCE & ENGINEERING
6	12	INFORMATION TECHNOLOGY
7.	33	COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
8.	67	CSE (DATA SCIENCE)
9.	66	CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
10.	62	CSE (CYBER SECURITY)
11.	69	CSE – INTERNET OF THINGS (IoT)

1.1 Eligibility Criteria for Admission

The eligibility criteria for admission into First year of four year B.Tech. degree programme shall be as mentioned below:

- The candidate shall be an Indian National.
- The candidate should have completed 16 years of age as on 31st December of the academic year for which the admissions are being conducted
- Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana State, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana State
- Seats in each programme in the Institution are classified into category-A and Category-B as per the Government Orders (G.Os.)

1.1.1 Category–A Seats:

These seats will be filled through counseling as per the rank at the Common Entrance Test (EAMCET) conducted by the State Government and State Government G.Os. as per other admission criteria laid down in the G.Os.

1.1.2 Category-B Seats :

These seats will be filled by the institute as per the G.Os. Issued by State Government from time to time.

1.1.3 Category: Lateral Entry

The Candidates shall be admitted into the Third semester, based on the rank secured by the candidate at Engineering Common Entrance Test (ECET (FDH)) by the Convener, ECET

1.1.4 Medium of Instruction

The medium of instructions for the entire under graduate progrmme in Engineering & Technology will be English only.

2. B.Tech Program Structure

2.1 Semester Scheme

Each under graduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each, semester having – 'Continuous Internal Evaluation (CIE) 'AND' Semester End Examination (SEE)' under Choice Based Credit System (CBCS) indicated by UGC, and curriculum/course structure as suggested by JNTUH & AICTE are followed.

After eight academic years of course of study, the candidate is permitted to write only supplementary examinations for two more years so that within 10 years the students can complete the B.Tech Degree.

The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for theory/ lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for laboratory/ practical (P) courses.
- Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab are mandatory courses. These courses will not carry any credits.

2.3 Subject Course Classification

All subjects/ courses offered for the under graduate programme (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes mathematics, physics and chemistry subjects
2		ES - Engineering Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PE – Professional Electives	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.
6		OE – Open Electives	
7	Core Courses	Project Work	B.Tech. project or UG project or UG major project or Project Stage I & II
8		Industrial training/ Mini- project	Industrial training/ Summer Internship/ Industrial Oriented Mini-project/ Mini-project
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch
10	Minor courses	-	of Engineering. 1 or 2 Credit courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory courses (non-credit)

3 Attendance Requirements:

3.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (excluding attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

3.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

3.3 A stipulated fee shall be payable for condoning of shortage of attendance.

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

3.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered.

3.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

4 Academic Requirements:

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.3.

4.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (25 marks out of 70 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.

4.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industrial Oriented Mini Project/Summer Internship and seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industrial Oriented Mini Project/Summer Internship, or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar as required in the IV year I Semester, or (iii) secures less than 40% marks in Industrial Oriented Mini Project/Summer Internship and seminar evaluations.

4.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	i) Regular course of study of first year second semester. ii) Must have secured at least 18 credits out of 37 credits i.e., 50% credits upto first year second semester from all the relevant regular and supplementary

		examinations, whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	i) Regular course of study of second year second semester. ii) Must have secured at least 47 credits out of 79 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	i) Regular course of study of third year second semester. ii) Must have secured at least 73 credits out of 123 credits i.e.,60% credits upto third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

4.4. A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, (iv) passes all the mandatory courses, to successfully complete the under graduate programme. The performance of the student in these 160 credits shall be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme), and shall be indicated in the grade card of IV year II semester.

4.5 A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure 'C' grade or above) then no SGPA/CGPA will be printed on the respective Grade Card. However he may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

4.6 A student detained in a semester due to shortage of attendance may be readmitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA/

CGPA calculations will be done for the entire semester in which the student has been detained.

4.7 A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which the student has been readmitted shall be applicable to him.

4.8 Supplementary examinations in the failed subject only for five times, in addition to one regular attempt (total six attempts). If the student is unable to clear the subject in six attempts altogether, the student shall appear for the examination in the same subjects with the revised syllabus i.e, the syllabus of equivalent subjects prevailing for the regular students in that academic year. However if no subject with 'similar title is offered in the current regulations, the examination shall be conducted in the failed subject with the syllabus which the student studied during his/her regular course of study.

5 Evaluation - Distribution and Weightage of marks

The performance of a student in every subject/course (including Practical's and Project Stage – I & II) will be evaluated for 100 marks each, with 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End-Examination).

5.1 For theory subjects, during a semester, there shall be two mid-term examinations conducted as per the academic calendar. Each mid examination is evaluated for 25 marks. First mid examination should be conducted for 1 to 2 ½ Units of syllabus and the second mid examination shall be conducted for 2 ½ to 5 Units of syllabus. The mid descriptive type exam paper consists of Section-A and Section-B.

Section-A [compulsory] consists of 5 short answer questions and each carries one mark.

Section-B consists of 6 questions out of which 4 are to be answered and each question carries 5 marks. The time duration of each mid examination is 90 minutes

Two assignments are to be given to students covering the syllabus of first mid and second Mid examinations and these assignments and Attendance are evaluated for 5 marks each. The first assignment shall be submitted before first mid examinations and second Assignment should be submitted before second mid examination.

At the end of the semester Internal Marks Maximum of 30 for the respective subjects are calculated as an average of the two midterm examinations

5.2 The semester end examinations (SEE) will be conducted for 70 marks consisting of two parts viz. i) Part- A for 20 marks, ii) Part - B for 50 marks.

Part-A is a compulsory question (numbered 1) consisting of **FIVE** short answer questions of four marks each and only one question to be set from a unit.

Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

5.2.1 For subjects like **Engineering Graphics/Engineering Drawing**, the SEE shall consist of five questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions. There shall be no Part – A, and Part – B system.

5.2.2 For subjects like **Machine Drawing Practice/Machine Drawing**, the SEE shall be conducted for 70 marks consisting of two parts viz. (i) Part – A for 30 marks. 3 out of 4 questions must be answered, (ii) Part – B for 40 marks. Part – B is compulsory.

5.2.3 For the Subject Estimation, Costing and Project Management, the SEE paper should consist of Part- A, Part-B and Part C.

Part – A : 1 out of 2 questions from Unit – I for 30 Marks,

Part – B : 1 out of 2 questions from Unit – II for 10 Marks

Part – C : 3 out of 5 questions from Units – III, IV, V for 30 Marks.

5.3 For practical subjects there shall be a continuous internal evaluation during the semester for 30 marks of CIE and 70 marks for semester end examination. Out of the 30 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned. The semester end examination shall be conducted with an external examiner and the laboratory teacher.

The external examiner shall be appointed by the Chief Superintendent in consultation with Dean/Controller of the Examination selects an external examiner from the list of experts in the relevant branch submitted by the HOD of the concern branch.

5.4 For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, machine drawing practice and estimation), the distribution shall be 30 marks for continuous internal evaluation (15 marks for day-to-day work and 15 marks for internal tests) and 70 marks for semester end examination. There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for internal tests.

5.5 For mandatory courses of Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab, a student has to secure 40 marks out of 100 marks (i.e. 40% of the marks allotted) in the continuous internal evaluation for passing the subject/course. No marks or letter grades shall be allotted for mandatory/non-credit courses. Only 'P'/'F' (Pass/Fail) shall be indicated in Grade Card.

5.6 There shall be a Technical Seminar presentation in III year II semester. For the seminar, the student shall collect the information on a specialized topic, prepare a technical report, and submit it to the department. It shall be evaluated by the departmental committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 100 internal marks. There shall be no semester end examination for the seminar.

5.7 There shall be a Comprehensive Viva-Voce in IV year I semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of the Head of the Department and three Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the student's understanding in various subjects studied during the B.Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There will be no internal assessment for the Comprehensive viva-voce.

5.8 There shall be an Industrial Oriented Mini Project/Summer Internship, in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester examinations and pursue it during summer vacation. Industrial Oriented Mini Project/Summer Internship shall be submitted in a report form and presented before the committee in IV year I semester. It shall be evaluated for 100 external marks.

The committee consists of an external examiner, Head of the Department, supervisor of the Industrial Oriented mini project/Summer Internship and a senior faculty member of the department. There shall be no internal marks for Industrial Oriented Mini Project/Summer Internship.

5.9 The Project work shall be started by the student in the beginning of the IV year II Semester. Out of a total of 200 marks for the project work, 50 marks shall be for Internal Evaluation and 150 marks for the Semester end Examination. The Semester end Examination (viva-voce) shall be conducted by a committee comprising of an external examiner, Head of the Department and the project supervisor. The evaluation of project work shall be conducted at the end of the IV year II Semester. The Internal Evaluation shall be on the basis of three seminars conducted during the IV year II semester for 20 marks by the committee consisting of Head of the Department, project supervisor and senior faculty member of the Department and for 30 marks by the supervisor of the project.

6 Credit Transfer System for MOOCs against Open / Professional Electives

The credit transfers of MOOC (Offered by SWAYAM/NPTEL / COURSERA etc.,) against Professional Electives **(3-I,3-II)** and Open electives **(4-I, 4-II)**. These rules shall be applicable from Academic Year 2020-2021.

6.1 The student shall be required to submit an **Application form/ UNDERTAKING**for final approval for credit transfer of MOOC against open electivealong with the photocopy of MOOC completion certificate to chairperson through HOD before the allotment of Professional Electives **(3-I, 3-II)** and Open electives **(4-I, 4-II)** to the UG/PG students.

6.2 Only those registered MOOC courses are allowed for Credit Transfer which have credits more than or equal to the credits assigned to Open Elective course or the MOOC course should be of minimum **4/8/12** weeks duration. The student can also choose to register and complete more than one MOOC of same or different subject areas. However, the total number of weeks of all such individual courses should be more than or equal to 4/8/12 and should either belong to SWAYAM-NPTEL OR otherwise COURSERA. However, the candidates have to submit MOOC certificate/certificates to acquire the total number of credits offered against the elective subject.

Credit Equivalence		
S. No.	**Course Duration**	**Credit Equivalence for Transfer of Credits**
UG / PG		
1	4 Weeks	1Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

6.3 While transferring the credit from MOOC against open elective or professional elective, the student can opt following combinations of MOOC with the approval of coordinator and head of the department.

I) for **3 credits:** a) 12 Weeks **(1)** (or)
b) 8 Weeks **(1)** + 4 Weeks **(1)** (or)
c) 4 Weeks **(1)** + 4 Weeks **(1)** + 4 Weeks **(1)**

II) for **2 Credits:** a) 8 Weeks **(1)** (or)
b) 4 Weeks **(1)** + 4 Weeks **(1)**

6.4 Credit transfer shall not be allowed, if the contents and topic of the MOOC which is identical (20% overlapping is permissible) to any of the courses including Open Elective courses offered by any department for UG/PG students. It is the responsibility of the HOD to verify and recommend the courses requested by students is satisfying criteria 2.

6.5 Scores of the MOOC courses completed by the students on permitted platforms satisfying all above conditions are valid till **2** years. Only such MOOC courses/Scores will be considered for credit transfer.

6.6 If the MOOC course in which the student is interested does not fall in the parent discipline of the student and belongs to other Engineering disciplines existing at Basic Sciences/Humanities/Management, the Departmental coordinator will seek opinion of concerned HoD to verify the matching of content of MOOC with that of Open Elective courses/Professional Elective courses offered.

6.7 If the above mentioned conditions are fulfilled, the Departmental Interdisciplinary coordinator will recommend the case to coordinator, Interdisciplinary Courses for final approval and accordingly notify to the students. After getting approval from HoD, the student may register for the MOOC course he/she can be allowed for and complete the same as per the requirements for credit transfer.

6.8 The coordinator, Interdisciplinary Courses, will consolidate the lists from all departments and submit the same for final approval. Chairperson will submit the list to Principal / Chairman.the final list will be forwarded to the Controller of Examination for further action.

6.9 The department/institution is not responsible for the registration of online MOOC. The candidates have to pay for registration of such courses.

6.10 Alternatively for online MOOC courses, the candidates have a choice to opt a subject from open/professional electives. The credit grade point mapping framework could be awarded based on the Grading Procedure para 7.2

7 Grading procedure

7.1 Grades will be awarded to indicate the performance of students in each theory subject, Laboratory / Practical's, Seminar, Industry Oriented Mini Project, and Project Stage – I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 5 above, a corresponding letter grade shall be given.

7.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	**O (Outstanding)**	**10**
80% and less than 90%	**A^+ (Excellent)**	**9**
70% and less than 80%	**A (Very Good)**	**8**
60% and less than 70%	**B^+ (Good)**	**7**
50% and less than 60%	**B (Average)**	**6**
40% and less than 50%	**C (Pass)**	**5**
Below 40%	**F(FAIL)**	**0**
Absent	**F(Ab)**	**0**

7.3 A student who has obtained an 'F' grade in any subject shall be deemed to have 'failed' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

7.4 To a student who has not appeared for an examination in any subject, 'F(Ab)' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will

remain the same as those obtained earlier.

7.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

7.6 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = Grade Point (GP) x Credits …. For a course

7.7 A student passes the subject/ course only when GP ≥ 5 ('C' grade or above)

7.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

$$\mathbf{SGPA} = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \text{ .... For each semester,}$$

where 'i' is the subject indicator index (takes into account all subjects in a semester),'N' is the no. of subjects 'registered' for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that ith subject.

7.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\mathbf{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where 'M' is the total no. of subjects (as specifically required and listed under the course structure of the parent department) the student has 'registered' i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that jth subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course/Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	**69**		**Total Credit Points**	**518**

CGPA = 518/69 = 7.51

7.10 Calculation process of CGPA will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. Programme.

7.11 For merit ranking or comparison purposes or any other listing, only the 'rounded off' values of the CGPAs will be used. SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester.

8 **Grace Marks**

Examination branch adds the grace marks, not exceeding 0.15% marks of the course total marks to one or two subjects in which the student failed if adding these grace marks helps the student to

i) Pass in these one or two failed subjects and
ii) Get eligibility to receive the degree.

These grace marks shall be added only when the candidate submits an undertaking stating that **"he/she will never apply for the supplementary exams conducted by the Institution in the future"** to the Principal.

9 Passing standards

A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.00 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire under graduate programme, only when gets a CGPA ≥ 5.00 for the award of the degree as required.

After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.), credits earned.

10 Declaration of results

Computation of SGPA and CGPA are done using the procedure listed in 6.6 to 6.9.

For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

11 Award of degree

11.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have **'Qualified'** for the award of B.Tech. degree in the chosen branch of Engineering selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in item 10.1 shall be placed in the following classes.

11.3 A student with final CGPA (at the end of the under graduate programme) ≥ 8.00, and fulfilling the following conditions - shall be placed in **'First Class with Distinction'.** However, he

A. Should have passed all the subjects/courses in **'first appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
B. Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from I year I semester onwards.
C. Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA ≥ 8 shall be placed in **'First Class'.**

11.4 Students with final CGPA (at the end of the under graduate programme) ≥ 6.50 but < 8.00 shall be placed in **'First Class'.**

11.5 Students with final CGPA (at the end of the under graduate programme) ≥ 5.50 but < 6.50, shall be placed in **'Second Class'.**

11.6 All other students who qualify for the award of the degree (as per item 10.1), with final CGPA (at the end of the under graduate programme) ≥ 5.00 but < 5.50, shall be placed in **'Pass Class'.**

11.7 A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

12 Withholding of Results

If the student has not paid the fees to the University at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13. Transitory Regulations

Students who have discontinued or have been detained for want of attendance or any other academic requirements, may be considered for readmission as and when they become eligible. They have to take up Equivalent subjects, as substitute subject in place of repetition of subjects as decided by the Institute Academic Committee.

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

15. The decision of the Institute Academic Committee will be final in respect of equivalent subjects for those students who are transferred from other colleges. The procedure for permitting students to transfer from other colleges will be decided by the principal / Institute Academic Committee keeping the Government Rules concerned in view.

16. TERMINATION FROM THE PROGRAMME

The admission of a student to the programme may be terminated and the student is asked to leave the college in the following circumstances:

i. The student fails to satisfy the requirements of the programme within the maximum period stipulated for that programme.

ii. The student fails to satisfy the norms of discipline specified by the institute from time to time.

17. CURRICULUM

i. For each programme being offered by the Institute, a Board of Studies (BOS) is constituted in accordance with AICTE / UGC / JNTUH statutes.

ii. The BOS for a programme is completely responsible for designing the curriculum once in three years for that programme.

18. GRIEVANCES REDRESSAL COMMITTEE

"Grievances and Redressal Committee" (General) constituted by the principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. The composition of the complaints cum redressal committee shall be:

Headed by Senior Faculty member
Heads of all departments
A senior lady staff member from each department (if available)

The committee constituted shall submit a report to the principal of the college, the penalty to be imposed. The Principal upon receipt of the report from the committee shall, after giving an opportunity of being heard to the person complained against, submit the case with the committee's recommendation to the Governing Body of the college. The Governing Body shall confirm with or without modification the penalty recommended after duly following the prescribed procedure.

19. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who does malpractice / behaves indiscipline in examinations. The committee shall consist of:

Principal.
Subject expert of which the subject belongs to.
Head of the department of which the student belongs to.
The invigilator concerned.
In-charge Examination branch of the college.

The committee constituted shall conduct the meeting on the same day of examination or latest by next working day to the incidence and punish the student as per the guidelines prescribed by the JNTUH/SICET from time to time.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

20. STUDENT'S FEEDBACK

It is necessary for the Colleges to obtain feedback from students on their course work and various academic activities conducted. For this purpose, suitable feedback forms shall be devised by the College and the feedback obtained from the students regularly in confidence, by administering the feedback form in print or on-line in electronic form.

The feedback received from the students shall be discussed at various levels of decision making at the College and the changes/ improvements, if any, suggested shall be given due consideration for implementation.

21. CONDUCT AND DISCIPLINE

i. Each student shall conduct himself / herself in a manner befitting his / her association with SICET.

ii. He / she is expected not to indulge in any activity, which is likely to bring disrepute to the college.

iii. He / she should show due respect and courtesy to the teachers, administrators, officers and employees of the college and maintain cordial relationships with fellow students.

iv. Lack of courtesy and decorum unbecoming of a student (both inside and outside the college), willful damage or removal of Institute's property or belongings of fellow students, disturbing others in their studies, adoption of unfair means during examinations, breach of rules and regulations of the Institute, noisy and unruly behaviour and similar other undesirable activities shall constitute violation of code of conduct for the student.

v. **Ragging in any form is strictly prohibited and is considered a serious offence. It will lead to the expulsion of the offender from the college.**

vi. Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.

vii. Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.

viii. A student may be denied the award of degree / certificate even though he / she has satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.

ix. Attendance is not given to the student during the suspension period.

22. Other Issues

The quality and standard of engineering professionals are closely linked with the level of the technical education system. As it is now recognized that these features are essential to develop the intellectual skills and knowledge of these professionals for being able to contribute to the society through productive and

satisfying careers as *innovators, decision makers and/or leaders* in the global economy of the 21st century, it becomes necessary that certain improvements are introduced at different stages of their education system. These include:

a) Selective admission of students to a programme, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.

b) Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and student's motivation are available.

c) Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.

d) Access to good library resources and Information & Communication Technology **(ICT)** facilities, to develop the student's *mind* effectively.

These requirements make it necessary for the College to introduce improvements like:

a) Teaching-learning process on modern lines, to provide *Add-On* Courses for *audit*/credit in a number of peripheral areas useful for student's self development.

b) Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.

c) Generous use of ICT and other modern technologies in everyday activities.

23. General

i. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

ii. The academic regulations should be read as a whole for the purpose of any interpretation.

iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

iv. In the case of any discrepancy/ambiguity/doubt arises in the above rules and regulations, the decision of the Principal shall be final.

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

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

(Applicable for students admitted from the academic year 2021-2022)

24.1 i. A student shall register for all 123 credits and secure 123 credits with CGPA ≥ 5 from II year to IV year B.Tech. Programme (LES) for the award of B.Tech. degree.

ii. A student who fails to fulfill the requirement for the award of the degree in six academic years from the year of their admission, shall forfeit their seat in B.Tech. programme and their admission stands cancelled.

iii. The same attendance regulations are adopted as that of B.Tech. Four year degree course.

24.2 Promotion Rule

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	iii) Regular course of study of second year second semester. iv) Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	iii) Regular course of study of third year second semester. iv) Must have secured at least 51 credits out of 86 credits i.e.,60% credits upto third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

24.3 All the other regulations as applicable to B.Tech. 4 - year degree course (Regular) will hold good for B.Tech. (Leteral Entry Scheme)

MALPRACTICES RULES DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS		
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Asst. – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.

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

Note : Students are advised to read the above regulations thoroughly. Ignorance with regards to the regulations cannot be construed as an excuse.

Frequently asked Questions and Answers about autonomy

1. **Who grants Autonomy? UGC, Govt., AICTE or University**

   In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy.

2. **Shall SICET award its own Degrees?**

   No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY on the Degree Certificate.

3. **What is the difference between a Deemed University and an Autonomy College?**

   A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. **How will the Foreign Universities or other stake – holders know that we are an Autonomous College?**

   Autonomous status, once declared, shall be accepted by all the stake holders. Foreign Universities and Indian Industries will know our status through our college website.

5. **What is the change of Status for Students and Teachers if we become Autonomous?**

   An autonomous college carries a prestigious image. Autonomy is actually earned out of continued past efforts on academic performances, capability of self-governance and the kind of quality education we offer.

6. **Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?**

   There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee is a Non – Statutory body, which will keep a watch on the academics and keep its reports and recommendations every year. In addition to Academic Council, the highest academic body also supervises the academic matters. At the end of three years, there is an external inspection by the University for this purpose. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7. **Will the students of SICET as an Autonomous College qualify for University Medals and Prizes for academic excellence?**

   No, SICET has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural and co-curricular organized by the University the students shall qualify.

8. **Can SICET have its own Convocation?**

   No, since the University awards the Degree the Convocation will be that of the University.

9. Can SICET give a provisional degree certificate?

Since the examinations are conducted by SICET and the results are also declared by SICET, the college sends a list of successful candidates with their final percentage of marks to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10. Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment, besides the autonomous status is more responsive to the needs of the industry. As a result, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 30% for internal assessment and 70% for external assessment. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. Will there be any Revaluation or Re-Examination System?

No. There will not be any Revaluation system or Re-examination. But, there is a personal verification of the answer scripts.

13. How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

14. Will the Degree be awarded on the basis of only final year performance?

No. The percentage of marks will reflect the average performance of all the semesters put together.

15. Who takes Decisions on Academic matters?

The Academic Council of College is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like the BOS which are like Boards of Studies of the University.

16. What is the role of Examination committee?

The Exam Committee is responsible for the smooth conduct of inter and external examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Memorandum of Marks etc fall within the duties of the Examination Committee.

17. Is there any mechanism for Grievance Redressal?

Yes, the college has grievance redressal committee, headed by a senior faculty member of the college.

18. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulations.

19. Who declares the result?

The result declaration process is also defined. After tabulation work the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the College Academic Council for its approval. The result is then declared on the college notice boards as well put on the web site of the college. It is eventually sent to the University.

20. What is our relationship with the Jawaharlal Nehru Technological University, Hyderabad?

We remain an affiliated college of the Jawaharlal Nehru Technological University, Hyderabad. The University has the right to nominate its members on the academic bodies of the college.

21. Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

22. Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our PG programmes are also enjoying autonomous status.

23. How many exams will be there as an autonomous college?

This is defined in the Rules & Regulations.

24 Is the College adapting Choice Based Credit System (CBCS) or Not ?
Yes, this College has adapted CBCS system with effect from the Academic Year 2016-17.

25. Note : What is Choice Based Credit System (CBCS)?

Choice Based Credit System (CBCS): The CBCS provides choice for students to selec from the prescribed courses (core, elective or minor or soft skill courses).

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SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Choice Based Credit System (CBCS)

REGULATIONS – BR20

B. Tech. ELECTRONICS & COMMUNICATION ENGINEERING

I YEAR I SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MTH1101	Mathematics – I (Linear Algebra and Calculus)	3	1	0	4
2	R20EAP1201	Applied Physics	3	1	0	4
3	R20CSE1101	Programming for Problem Solving	3	1	0	4
4	R20MED1102	Engineering Graphics	1	0	4	3
5	R20EAP12L1	Applied Physics Lab	0	0	3	1.5
6	R20CSE11L2	Programming for Problem Solving Lab	0	0	3	1.5
7	R20HAS1102	Environmental Science	3	0	0	0
8	R20IPG1101	Induction Programme for Three Weeks	0	0	0	0
		Total Credits	**13**	**3**	**10**	**18**

I YEAR II SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MTH1201	Mathematics – II (Advanced Calculus)	**3**	**1**	**0**	**4**
2	R20ECH1101	Chemistry	**3**	**1**	**0**	**4**
3	R20EEE1101	Basic Electrical Engineering	**3**	**0**	**0**	**3**
4	R20MED1101	Engineering Workshop	**1**	**0**	**3**	**2.5**
5	R20HAS1101	English	**2**	**0**	**0**	**2**
6	R20ECH11L1	Engineering Chemistry Lab	**0**	**0**	**3**	**1.5**
7	R20HAS11L2	English Language and Communication Skills Lab	**0**	**0**	**2**	**1**
8	R20EEE11L3	Basic Electrical Engineering Lab	**0**	**0**	**2**	**1**
9	R20COI1101	Constitution of India	**3**	**0**	**0**	**0**
10	R20ITK1101	Essence of Indian Traditional Knowledge	**3**	**0**	**0**	**0**
		Total Credits	**18**	**2**	**10**	**19**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Choice Based Credit System (CBCS)

REGULATIONS – BR20

B. Tech. ELECTRONICS & COMMUNICATION ENGINEERING

II YEAR I SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE2101	Electronic Devices and Circuits	3	1	0	4
2	R20EEE2104	Network Theory	3	0	0	3
3	R20ECE2102	Digital Logic Design	3	0	0	3
4	R20ECE2103	Signals and Systems	3	1	0	4
5	R20ECE2104	Probability Theory and Stochastic Processes	3	0	0	3
6	R20ECE21L1	Electronic Devices and Circuits Lab	0	0	3	1.5
7	R20ECE21L2	Digital Logic Design Lab	0	0	3	1.5
8	R20ECE21L3	Basic Simulation Lab	0	0	2	1
9	R20MAC2100	Gender Sensitization Lab	0	0	2	0
		Total Credits	**15**	**2**	**10**	**21**

II YEAR II SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MTH2201	Laplace Transforms, Numerical Methods & Complex Variables	3	1	0	4
2	R20ECE2201	Electromagnetic Theory And Transmission Lines	3	0	0	3
3	R20ECE2202	Analog and Digital Communications	3	1	0	4
4	R20ECE2203	Linear and Digital IC Applications	3	0	0	3
5	R20ECE2204	Electronic Circuit Analysis	3	0	0	3
6	R20ECE22L1	Analog and Digital Communications Lab	0	0	3	1.5
7	R20ECE22L2	IC Applications Lab	0	0	3	1.5
8	R20ECE22L3	Electronic Circuit Analysis Lab	0	0	2	1
9	R20MAC2200	Intellectual Property Rights	3	0	0	0
		Total Credits	**18**	**2**	**8**	**21**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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Choice Based Credit System (CBCS)

REGULATIONS – BR20

B. Tech. ELECTRONICS & COMMUNICATION ENGINEERING

III YEAR I SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MBA2201	Business Economics & Financial Analysis	3	0	0	3
2	R20ECE3101	Microprocessors & Microcontrollers	3	1	0	4
3	R20INF3103	Data Communications and Networks	3	1	0	4
4	R20EEE2202	Control Systems	3	1	0	4
5	**Professional Elective – I**					
	R20CSE3114	Computer Organization & Operating Systems	3	0	0	3
	R20ECE3112	Coding Theory & Techniques				
	R20ECE3113	Electronic Measurements & Instrumentation				
	R20MAC3100	MOOCs-I				
6	R20ECE31L1	Microprocessors & Microcontrollers Lab	0	0	3	1.5
7	R20INF31L2	Data Communications and Networks Lab	0	0	3	1.5
8	R20HAS31L1	Advanced Communication Skills Lab	0	0	2	1
		Total Credits	**15**	**3**	**8**	**22**

III YEAR II SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE3201	Antennas and Wave Propagation	3	1	0	4
2	R20ECE3202	Digital Signal Processing	3	1	0	4
3	R20ECE3203	VLSI Design	3	1	0	4
4	**Professional Elective - II**					
	R20ECE3221	Embedded System Design	3	0	0	3
	R20CSE4152	Internet of Things (IOT)				
	R20CSE3201	Machine Learning				
	R20MAC3200	MOOCs-II				
5		Open Elective - I	3	0	0	3
6	R20ECE32L1	Digital Signal Processing Lab	0	0	3	1.5
7	R20ECE32L2	VLSI & e-CAD Design Lab	0	0	3	1.5
8	R20ECE32L3	Technical Seminar	0	0	2	1
		Total Credits	**15**	**3**	**8**	**22**

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Choice Based Credit System (CBCS)

REGULATIONS – BR20

B. Tech. ELECTRONICS & COMMUNICATION ENGINEERING

IV YEAR I SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE4101	Microwave and Optical Communication	3	1	0	4
2	R20HAS4101	Professional Practice, Law & Ethics	2	0	0	2
3	**Professional Elective – III**					
	R20ECE4131	Digital Image Processing	3	1	0	4
	R20CSE4101	Cryptography and Network Security				
	R20CSE3122	Artificial Intelligence (AI)				
4	**Professional Elective – IV**					
	R20ECE4141	Cellular & Mobile Communications	3	1	0	4
	R20ECE4142	Digital Signal Processors & Architectures				
	R20ECE4143	System on Chip Architecture				
5		Open Elective - II	3	0	0	3
6	R20ECE41L1	Microwave & Optical Communications Lab	0	0	2	1
7	R20ECE41L2	Comprehensive Viva Voce	0	0	2	1
8	R20ECE41P2	Industrial Oriented Mini Project/ Summer Internship	0	0	0	2*
		Total Credits	**14**	**3**	**4**	**21**

*** To be carried out during the summer vacation between 6th and 7th semesters.**

Note: Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

IV YEAR II SEMESTER **COURSE STRUCTURE**

S. No.	Course Code	Course Title	L	T	P	Credits
1	**Professional Elective – V**					
	R20ECE4251	Satellite Communications	3	0	0	3
	R20ECE4252	Low Power VLSI				
	R20ECE4253	Wireless Sensor Networks				
2	**Professional Elective – VI**					
	R20ECE4261	Wireless Communication & Networks	3	0	0	3
	R20ECE4262	Electronic Product Design & Packaging				
	R20ECE4263	Radar Systems				
3		Open Elective - III	3	0	0	3
4	R20ECE42P1	Project Work	0	0	14	7
		Total Credits	**9**	**0**	**14**	**16**

***MC – Satisfied/Unsatisfied**

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B.Tech. - I Year – I Semester

L	T	P	C
3	1	0	4

(R20MTH1101) Mathematics – I
(Linear Algebra and Calculus)

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form.
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences. Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT-IV: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V: Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity.

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence, independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.

REFERENCES:

- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
- Engineering Mathematics by M.K.Jain, S.R.K. Iyengar, Narosa Publications

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B.Tech. - I Year – I Semester

L	T	P	C
3	1	0	4

(R20EAP1101) APPLIED PHYSICS

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

a. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
b. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
c. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
d. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

i. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
ii. Halliday and Resnick, Physics - Wiley.
iii. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCES:

a) Richard Robinett, Quantum Mechanics
b) J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
c) Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL

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B.Tech. - I Year – I Semester

L	T	P	C
3	1	0	4

(R20CSE1101) PROGRAMMING FOR PROBLEM SOLVING

Course Objectives:

a) To learn the fundamentals of computers.
b) To understand the various steps in program development.
c) To learn the syntax and semantics of C programming language.
d) To learn the usage of structured programming approach in solving problems.

Course Outcomes: The student will learn

a) To write algorithms and to draw flowcharts for solving problems.
b) To convert the algorithms/flowcharts to C programs.
c) To code and test a given logic in C programming language.
d) To decompose a problem into functions and to develop modular reusable code.
e) To use arrays, pointers, strings and structures to write C programs.
f) Searching and sorting problems.

Unit - 1: Introduction to Algorithms and Programming, Arrays

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

Algorithms for finding roots of quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, etc.

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations.

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Unit - II: Strings, Structures and Functions:

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of Pointers: Idea of pointers,

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Unit - III: Pointers and Dynamic Memory Allocation:

Command line arguments

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

Unit - IV: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

Unit - V: Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs

TEXT BOOKS:

a) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
b) B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3^{rd} Edition)

REFERENCE BOOKS:

a) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
b) R.G. Dromey, How to solve it by Computer, Pearson (16^{th} Impression)
c) Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
d) Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4^{th} Edition
e) E. Balaguruswamy, Programming in ANSI C, Tata McGraw - Hill

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B.Tech. - I Year – I Semester

L	T	P	C
1	0	4	3

(R20MED1102) ENGINEERING GRAPHICS

Course objectives:

a) To provide basic concepts in engineering drawing.
b) To impart knowledge about standard principles of orthographic projection of objects.
c) To draw sectional views and pictorial views of solids.

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

a) Preparing working drawings to communicate the ideas and information.
b) Read, understand and interpret engineering drawings.

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT- II

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone,
Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT – V

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions.
Introduction to the perspective views, their types & Perspective views of simple objects

Introduction to CAD:

Introduction to AUTOCAD Software Package Commands.- Creation of 2D Sketches by CAD Package

TEXTBOOKS:

a) Engineering Drawing N.D. Bhatt / Charotar
b) Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.
3. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

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B.Tech. - I Year – I Semester

L	T	P	C
0	0	3	1.5

(R20EAP12L1) APPLIED PHYSICS LAB

List of Experiments:

1. VI Characteristics of PN junction diode:

2. Solar Cell:
   To study the V-I Characteristics of solar cell.

3. Light emitting diode:
   Plot V-I and P-I characteristics of light emitting diode.

4. Hall effect:
   To determine Hall co-efficient of a given semiconductor.

5. Photoelectric effect:
   To determine work function of a given material.

6. LASER:
   To study the characteristics of LASER sources.

7. Optical fibre:
   To determine the bending losses of Optical fibres.

8. BH Curve
   To study the Phenomena of Magnetic Hysteresis loop

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B.Tech. - I Year – I Semester

L	T	P	C
0	0	3	1.5

(R20CSE11L2) PROGRAMMING FOR PROBLEM SOLVING LAB

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code::Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Simple numeric problems:

a. Write a program for find the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 = 10
   5 x 3 = 15
e. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 ($= 9.8\ m/s^2$)).
b. 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)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value. $1-x/2 +x^2/4-x^3/6$
i. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
c. Write a C program that uses functions to perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
d. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the GCD (greatest common divisor) of two given integers.
   iii. To find x^n
e. Write a program for reading elements using pointer into array and display the values using array.
f. Write a program for display values reverse order from array using pointer.
g. Write a program through pointer variable to sum of n elements from array.

Files:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program that does the following:
It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function)
The program should then read all 10 values and print them back.
e. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
i. To insert a sub-string in to a given main string from a given position.
ii. To delete n Characters from a given position in a given string.
d. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
e. Write a C program that displays the position of a character ch in the string S or –1 if S doesn‘t contain ch.
f. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices
are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
b. Write a C program to construct a pyramid of numbers as follows:

```
1          *        1        1          *
1 2        * *      2 3      2 2        * *
1 2 3      * * *    4 5 6    3 3 3      * * *
                             4 4 4 4    * *
                                        *
```

Sorting and Searching:

a. Write a C program that uses non recursive function to search for a Key value in a given
b. list of integers using linear search method.
c. Write a C program that uses non recursive function to search for a Key value in a given
d. sorted list of integers using binary search method.
e. Write a C program that implements the Bubble sort method to sort a given list of
f. integers in ascending order.
g. Write a C program that sorts the given array of integers using selection sort in descending order
h. Write a C program that sorts the given array of integers using insertion sort in ascending order
i. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:

i. Byron Gottfried, Schaum’s Outline of Programming with C, McGraw-Hill
ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

iv. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
v. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
vi. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

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B.Tech. - I Year – I Semester

L	T	P	C
3	0	0	0

(R20HAS1102) ENVIRONMENTAL SCIENCE

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4^{th} Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

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B.Tech. - I Year – II Semester

L	T	P	C
3	1	0	4

(R20MTH1102) MATHEMATICS – II
(Advanced Calculus)

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE

Exact, linear and Bernoulli's equations; Applications : Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-II: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non-Homogeneous; terms of the type e^{ax}, sinax , cosax , polynomials in x, $e^{ax}V(x)$ and $xV(x)$; Method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelopiped).

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

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L	T	P	C
3	1	0	4

(R20ECH1101) CHEMISTRY

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To understand the concepts of Polymers and Lubricants.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course Outcomes: The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The knowledge of Polymers and Lubricants.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

Unit - I:

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2 and O_2 molecules and their Magnetic properties.

Metallic Bonding, Valency Bond Theory(VBT), Crystal Field Theory (CFT): Salient features of CFT – Crystal Field splitting of transition metal ion d-orbitals in tetrahedral, octahedral and square planar geometries.

Unit - II:

Water and its treatment: Introduction – hardness of water – causes of hardness - types of hardness: temporary and permanent – expression and units of hardness, Numerical problems.

Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler troubles-scales & sludges, priming and foaming, caustic embrittlement, boiler feed water-internal treatment – (Calgon conditioning, Phosphate conditioning and Colloidal conditioning).

External treatment of water – ion exchange process. Desalination of water – Reverse osmosis.

Unit - III:

Electrochemistry and corrosion: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation and its applications. Electrochemical series and its applications. Numerical problems.

Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery). Fuel cells – Hydrogen – Oxygen fuel cell, methanol – oxygen fuel cell – construction, working, advantages and applications of fuel cells.

Corrosion : Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion – nature of metal & nature of environment.
Corrosion control methods- Cathodic protection - Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings - hot dipping, (galvanizing, tinning), electroplating (copper Plating), Electroless Plating (copper plating)

Unit - IV:
Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Classification of Isomers - structural and stereoisomers. Enantiomers, diastereomers, measurement of optical activity, absolute configuration. conformational analysis of n- butane.
Types of Organic Reactions (Addition, Substitution and Elimination Reactions).
Substitution reactions: Nucleophilic substitution reactions: Mechanism of S_N1, S_N2 reactions.
Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule Grignard additions on carbonyl compounds. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ and chromic acid.
Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$.
Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

Unit - V:
Polymers : Definitions, Classification, properties of polymers – crystallinity, melting Point, boiling Point, glass Transition Temperature. Preparation, properties, engineering applications of: PVC, Teflon, Nylon & Bakelite.
Lubricants: classification, characteristics of a good Lubricant, mechanism of lubrication (thick film, thin film & extreme pressure lubrication) and properties of lubricants: flash and fire point, cloud and pour point, mechanical stability of lubricants.

Suggested Text Books:
1. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2018.
2. Engineering Chemistry, by Prasanta Rath, B. Rama Devi, Ch. Venkata Ramana Reddy, Subhendu Chakroborty, Cengage Learning India Pvt. Ltd., 2018.
3. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5^{th} Edition.
4. University Chemistry, by B.M. Mahan, Pearson IV Edition.
5. Text Book of Organic Chemistry by Bahl & Bahl.
6. Text Book of Stereo Chemistry by Kalsi.

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3	0	0	3

(R20EEE1130) BASIC ELECTRICAL ENGINEERING

Course Objectives:
- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:
- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

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. Time-domain analysis of first-order RL and RC circuits.

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 and parallel), resonance in series R- L-C circuit.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers
Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque- slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

UNIT-V: Electrical Installations
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Text-Books/Reference-Books:
1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

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L	T	P	C
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(R20MED1101) ENGINEERING WORKSHOP

Pre-requisites: Practical skill

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

Syllabus :

- **Introduction to Carpentry :** Types Wood, Sizes of Wood or Timber, Characteristics of Wood, Types of Marking and Measuring Tools, Holding Tools, Cutting Tools, Planing Tools, Types of Chisels and their specifications, Drilling and Boring Tools and their Sketches, Wood Working Lathe and its parts, Drilling Machine and its parts, Types of saws, Sawing Machines such as Jigsaw, Bandsaw, Scrollsaw etc., Care and Maintenance of Tools.
- **Introduction to Fitting :** Holding Tools, Marking and Measuring Tools, Cutting Tools, Taps and Tap Wrenches, Dies and Die Holders, Bench Drilling Machine with Sketch and Specifications, Types of Files, File Card, Types of Hammers, Spanners, Screwdrivers, Fitting operations, Forms of Materials, Care and Maintenance of Tools
- **Introduction of Tin-Smithy :** Sheet Materials, Hand Tools, Hammers, Stakes, Sheet Metal Joints, Revets and Screws, Soldering and Brazing.
- **Introduction to Foundry :** Casting and its components such as Molding sands and their types, Properties, Types patterns, Pattern making materials, Tools used for the Molding, Melting Furnaces such as Cupola, Pot Furnace, Crucible Furnace
- **Introduction to Welding :** Various Welding processes such as Arc Welding, Gas Welding, Resistance Welding, Thermit Welding, Friction Welding, Elementary Symbols of the Welding, Transformers, Motor Generators, Rectifyers, Welding cables, Electrodes and their types, Electrode Holders, Techniques of Welding, Gas Welding their Types
- **Introduction to House-wiring :** Types of the Tools using House-wiring, Types of House-

wiring System, Fuses, Circuit Breakers, Switches, Sockets and Common House-wiring Methods, Various Symbol for Electrical Items.

- **Introduction to Black Smithy :** Tools and equipment used in the Black Smithy, Forging Temperatures of metals.
- Introduction to the Plumbing, Machine Shop, Metal Cutting, Power Tools.

1. TRADES FOR EXERCISES:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit & Drilling and tapping)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

Workshop Practice /B. L. Juneja / Cengage
Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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2	0	0	2

(R20HAS1101) ENGLISH

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

Learning Objectives: The course will help to

a. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
b. Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
c. Develop study skills and communication skills in formal and informal situations.

Course Outcomes: Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

UNIT –I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures - Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT –II

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
Reading: Improving Comprehension Skills – Techniques for Good Comprehension
Writing: Format of a Formal Letter-**Writing Formal Letters** E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT –III
'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-skills of Reading- Skimming and Scanning
Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Process, Places and Events
Classifying- Providing Examples or Evidence

UNIT –IV
'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary: Standard Abbreviations in English
Grammar: Redundancies and Clichés in Oral and Written Communication.
Reading: Comprehension- Intensive Reading and Extensive Reading
Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT –V
'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.
Vocabulary : Technical Vocabulary and their usage
Grammar : Common Errors in English
Reading : Reading Comprehension-Exercises for Practice
Writing : Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Prescribed Textbook:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

References:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

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(R20ECH11L1) ENGINEERING CHEMISTRY LAB

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- The measurement of physical properties like Surface Tension and viscosity.
- The Measurement of conductance and EMF.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Determination of physical properties like adsorption and viscosity.
- Measurement of conductance and EMF.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Conductometric titration of strong acid Vs strong base (HCl Vs NaOH)
4. Conductometric titration of Weak acid Vs strong base (CH3COOH Vs NaOH)
5. Titration of strong acid Vs strong base by potentiometry (HCl Vs NaOH)
6. Estimation of Fe^{2+} by Potentiometry using $K_2Cr_2O_7$ / $KMnO_4$.
7. Synthesis of Aspirin.
8. Synthesis of Paracetamol.
9. Determination of viscosity of lubricants by using Ostwald's viscometer.
10. Determination of surface tension of a given liquid by using stalagmometer.

References

1. Vogel's text book of practical chemistry 5^{th} edition
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)

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(R20HAS11L2) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

Learning Outcomes : Students will be able to attain

- Better understanding of nuances of English language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Listening Skills

Objectives

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
   - Oral practice: Just A Minute (JAM) Sessions
   - Describing objects/situations/people
   - Role play – Individual/Group activities

- **The following course content is prescribed for the English Language and Communication Skills Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus is very limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)**

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers to Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – V
CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests.
ICS Lab:
Understand: Interview Skills.
Practice: Mock Interviews.

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Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**
   The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):
Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**
   The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

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(R20EEE11L3) BASIC ELECTRICAL ENGINEERING LAB

Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

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(R20ECE2101) Electronic Devices and Circuits

Objectives:

This is a fundamental course, basic knowledge of which is required by all the circuit branch engineers. This course focuses:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, BJT and FET transistors and amplifier circuits.
- To understand diode as rectifier.
- To study basic principle of filter circuits and various types.

UNIT -I:

P-N Junction Diode: Qualitative Theory of P-N Junction, P-N Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics.

Special Purpose Electronic Devices: Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode, SCR and Semiconductor Photo Diode.

UNIT-II:

Rectifiers and Filters : The P-N junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L-Section Filters, π- Section Filters, Comparision of Filters, Voltage Regulation using Zener Diode.

UNIT-III:

Bipolar Junction Transistor and UJT: The Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, BJT Operation, BJT Symbol, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation , BJT Specifications, BJT Hybrid Model, Determination of h-parameters from Transistor Characteristics, Comparison of CB, CE, and CC Amplifier Configurations, UJT and Characteristics.

UNIT-IV:

Transistor Biasing and Stabilization: Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector – Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in VBE and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis Transistor Amplifier Circuit using h-parameters

UNIT-V:

Field Effect Transistor and FET Amplifiers

Field Effect Transistor: The Junction Field Effect Transistor (Construction, principle of operation, symbol) – Pinch-off Voltage - Volt-Ampere characteristics, The JFET Small Signal Model, MOSFET (Construction, principle of operation, symbol), MOSFET Characteristics in Enhancement and Depletion modes.

FET Amplifiers: FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, Biasing FET, FET as Voltage Variable Resistor, Comparison of BJT and FET.

TEXT BOOKS:

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2 Ed., 1998, TMH.
2. Electronic Devices and Circuits – Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices and Circuits – David A. Bell, 5 Ed, Oxford

REFERENCE BOOKS:

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.
3. Electronic Devices and Circuits – B. P. Singh, Rekha Singh, Pearson, 2Ed, 2013.
4. Electronic Devices and Circuits - K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 Ed.,2009,Wiley India Pvt. Ltd.
6. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 Ed., 2008,TMH.

Course Outcomes:

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

C211.1. Describe the construction, operation and characteristics of electronic devices like P-N-Junction and special Purpose diodes (K2-Understand).
C211.2. Determine the application of diode as a rectifier (K3-Apply)
C211.3. Illustrate the application of transistors as amplifier employing BJT devices (K3-Apply)
C211.4 Analyse the Biasing circuits using BJT Transistor Amplifier Circuit (K4-Analyse)
C211.5 Evaluate construction, operation and characteristics of FET (K5-Evaluate)
C211.6 Select Biasing circuits using FET Amplifiers (K4-Analyse)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C211.1	3	3	-	-	-	-	-	-	-	-	-	-	3	2	2
C211.2	3	3	-	-	-	-	-	-	-	-	-	-	3	2	2
C211.3	3	2	3	3	-	2	-	-	-	-	-	-	3	2	2
C211.4	3	2	3	3	-	2	-	-	-	-	-	-	3	2	3
C211.5	3	2	3	3	-	2	-	-	-	-	-	-	3	2	3
C211.6	3	2	3	3	-	3	-	-	-	-	-	-	3	2	3
C211	**3**	**2.3**	**3**	**3**	**-**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**2.5**

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(R20EEE2104) Network Theory

Course Objectives:

- To understand Magnetic Circuits, Network Topology and Three phase circuits.
- To analyze transients in Electrical systems.
- To evaluate Network parameters of given Electrical network
- To design basic filter configurations

UNIT – I Magnetic Circuits:

Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit – Analysis of series and parallel magnetic circuits

Network topology: Definitions– Graph – Tree, Basic cut set and Basic Tie set matrices for planar networks – Star – Delta - Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.

UNIT – II Three phase circuits:

Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – Measurement of active and reactive power.

UNIT – III Transient Analysis:

Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations – Initial conditions – Classical method and Laplace transforms methods of solutions. Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

UNIT – IV Network Parameters:

Network functions driving point and transfer impedance function networks- poles and zeros –necessary conditions for driving point function and for transfer function Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations– 2- port network parameters using transformed variables .

UNIT – V Filters:

Introduction to filters –low pass – high pass and band pass – RC, RL, filters- constant K and m derived filters and composite filter design.

TEXT BOOKS

- "N. C. Jagan & C. Lakshminarayana", "Network Theory", B.S Publications, 2014.
- "William Hayt and Jack E. Kemmerly", "Engineering circuit analysis", Mc Graw Hill Company, 6th edition, 2016.
- "D. Roy Chowdary", "Networks and systems", New age international publishers, 2009.
- "A. Chakrabarthy", Circuit Theory, Dhanpat Rai, 2005.

REFERENCE BOOKS:

- "Van Valkenburg", "Network Analysis", PHI, 3rd Edition, 2014
- "Franklin F Kuo," "Network Analysis & Synthesis", Wiley India PVT. Ltd., second Edition, 2006

- "K.C. A. Smith & R. E. Alley", "Electrical Circuits", Cambridge University Press, 1992
- "K. Rajeswaran", "Electric Circuit theory", Pearson Education, 2004.
- "A. Bruce Carlson", "Circuits", Thomson Publishers, 1999
- Course Outcomes: After this course, the student will be able to
- Analyze the Electrical Circuits with the concept of Network topology
- Apply the concepts of Magnetic circuit & Analyze Magnetic circuits
- Determine self and mutually induced EMF's for Magnetically coupled coils
- Understand the importance of three phase circuits and Analyze the three phase circuits with Star & Delta connected balanced and unbalanced loads
- Analyze the transient behavior of electrical networks for various excitations
- Obtain the various network parameters for the given two port networks
- Represent the transfer function for the given network
- Determine the parameters for the design of various filters

Course Outcomes:

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

C212.1. Apply the knowledge of basic Magnetic Circuits

C212.2. Analyze the planar networks by using Graph Theory

C212.3. Analyze the three phase circuits using Star Delta

C212.4. Evaluate Transient Response, Steady State response by using Laplace Transform method

C212.5. Evaluate Two Port network parameter and analyze the transmission line and transistor network

C212.6. Describe the basic filters and classifies the filters

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C212.1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
C212.2	2	3	3	3	-	-	-	-	-	-	-	-	3	2	-
C212.3	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
C212.4	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
C212.5	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
C212.6	3	3	2	2	3	-	-	-	-	-	-	-	3	2	-
C212	**2.8**	**3**	**2.3**	**2.2**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**

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(R20ECE2102) Digital Logic Design

Course Objectives:

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To provide extended knowledge of digital logic circuits in the form of state model approach.

UNIT -I:

Number System and Boolean Algebra And Switching Functions: Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra*:* Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT -II:

Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

UNIT -III:

Sequential Machines Fundamentals: Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The " Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration, Clock Skew.

UNIT -IV:

Sequential Circuit Design and Analysis: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops Counters - Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

UNIT -V:

Sequential Circuits: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified sequential machines, Partition techniques and merger chart methods – concept of minimal cover table. Algorithmic State Machine: Salient features of the ASM chart.

TEXT BOOKS:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design- Morris Mano, PHI, 3rd Edition.
3. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.

REFERENCE BOOKS:

1. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed,John Wiley & Sons Inc.
2. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier
4. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
5. Digital Logic Applications and Design- John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and State Machine Design – Comer, 3rd, Oxford, 2013.

Course Outcomes:

Upon completion of the course, students should possess the following skills:

C213.1 Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3. (K2-Understanding)

C213.2 Describe the operation of logic gates and Apply Boolean Algebra on K- map. (K3-Applying)

C213.3 Design / Analysis of Combinational Circuits. (K6-Create)

C213.4 Diagram illustrates the operation &timing constrains for Latches &Flip-Flops and Registers and Counters. (K4-Analyzing)

C213.5 Design &analyze sequential circuits. (K6-Create)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C213.1	3	3	2	-	-	2	-	-	-	-	-	-	3	3	-
C213.2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-
C213.3	3	3	3	3	2	-	-	-	-	-	-	-	3	3	-
C213.4	3	3	3	3	2	-	-	-	-	-	-	-	3	3	-
C213.5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
C213	**3**	**3**	**2.6**	**3**	**2.3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

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(R20ECE2103) Signals and Systems

Objectives:

This is a core subject, basic knowledge of which is required by all the engineers.
This course focuses on:

- To get an in-depth knowledge about signals, systems and analysis of the same using various transforms.
- To represent the periodic signal in terms of Fourier series
- To sketch spectrum using transformation techniques like FT, LT and ZT.
- To design distortion less LTI system

UNIT-I:

Signal Analysis and Fourier Series

Signal Analysis: 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, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

Fourier Series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

UNIT-II:

Fourier Transforms and Sampling

Fourier Transforms: Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Typers of Sampling - Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-III:

Signal Transmission Through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time.

UNIT-IV:

Convolution and Correlation of Signals: Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function, 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:

Laplace Transforms and Z-Transforms

Laplace Transforms: Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Z–Transforms: Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of ZTransform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed., PHI.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2 Ed.
2. Signals and Signals – Iyer and K. Satya Prasad, Cengage Learning
3. Signals and Systems – A.Rama Krishna Rao – 2008, TMH.
4. Introduction to Signal and System Analysis – K.Gopalan 2009, Cengage Learning.
5. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
6. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.

Course Outcomes:

Upon completing this course the student will be able to:

C214.1. Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals.(K2-Understand)

C214.2 **.**Sketch Fourier spectrum by using Fourier series and Fourier transforms. (K3-Apply)

C214.3. Describe sampling theorem to reconstruct signal from its samples.(K2-Understand)

C214.4. Design a distortion less LTI system and derive filter characteristics of a system.(K6-Create)

C214.5. Test parsevals theorem and explain the concepts convolution, correlation in time domain and frequency domain.(K2-Understand)

C214.6. Analyze Lapalce Transforms, Fourier Transforms and Z-Transforms.(K4-Analyze)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C214.1	3	3	2	-	3	-	-	-	-	-	-	-	3	-	2
C214.2	3	3	3	-	3	-	-	-	-	-	-	-	3	-	2
C214.3	3	3	3	-	3	-	-	-	-	-	-	-	3	-	2
C214.4	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C214.5	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C214.6	3	3	3	2	3	-	-	-	-	-	-	-	3	-	3
C214	**3**	**3**	**2.8**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2.5**

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(R20ECE2104) Probability Theory and Stochastic Processes

Objectives:

The primary objective of this course is:

- To provide mathematical background and sufficient experience so that the student can read, write, and understand sentences in the language of probability theory, as well as solve probabilistic problems in signal processing and Communication Engineering.
- To introduce students to the basic methodology of "probabilistic thinking" and to apply it to problems;
- To understand basic concepts of probability theory and random variables, how to deal with multiple random variables, Conditional probability and conditional expectation, joint distribution and independence, mean square estimation.
- To understand the difference between time averages and statistical averages
- Analysis of random process and application to the signal processing in the communication system.
- To teach students how to apply sums and integrals to compute probabilities, means, and expectations.

UNIT-I:

Probability and Random Variable

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

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

UNIT -II:

Distribution & Density Functions and Operation on One Random Variable – Expectations

Distribution & Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density and Properties.

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, Transformation of a Discrete Random Variable.

UNIT-III:

Multiple Random Variables and Operations

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV:

Stochastic Processes – Temporal Characteristics: The Stochastic 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, Nth 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 and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V:

Stochastic Processes – Spectral Characteristics: Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross- Power Spectral Density of Input and Output of a Linear System.

Noise Sources - Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4Ed., 2001, TMH.
2. Probability and Random Processes – Scott Miller, Donald Childers, 2 Ed, Elsevier, 2012.

REFERENCE BOOKS:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S.Unnikrishna Pillai, Ed., TMH.
2. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, 3 Ed., PE
4. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, 3 Ed., 1999, Oxford.
5. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

Outcomes:

Upon completion of the subject, students will be able to compute:

C215.1. Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variables (K3- Applying)

C215.2. Explain the concepts of expectation and conditional expectation, and describe their properties (K2- Understanding)

C215.3. Analyze continuous and discrete-time random processes (K4-Analyzing)

C215.4. Explain the concepts of stationary and wide-sense Stationarity, and appreciate their significance (K2- Understanding)

C215.5. Apply the theory of stochastic processes to analyze linear systems (K3- Applying)

C215.6. Apply the above knowledge to solve basic problems in filtering, prediction and smoothing (K3- Applying)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C215.1	3	-	2	2	-	-	-	-	-	-	-	-	3	3	-
C215.2	-	2	3	3	-	-	-	-	-	-	-	-	3	2	-
C215.3	3	3	3	2	-	-	-	-	-	-	-	-	3	3	-
C215.4	3	3	-	3	3	-	-	-	-	-	-	-	3	3	-
C215.5	3	3	-	3	3	-	-	-	-	-	-	-	3	3	-
C215.6	3	3	-	3	3	-	-	-	-	-	-	-	3	3	-
C215	**3**	**2.8**	**2.7**	**2.7**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.8**	**-**

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(R20ECE21L1) Electronic Devices and Circuits Lab

PART A: (Only for Viva-voce Examination)

Electronic Workshop Practice (In 3 Lab Sessions):

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of
   i) Multimeters (Analog and Digital)
   ii) Function Generator
   iii) Regulated Power Supplies
   iv) CRO.

PART B: (For Laboratory Examination – Minimum of 10 experiments)

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters.
5. Input & Output Characteristics of Transistor in CB Configuration and h-parameter calculations.
6. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
7. FET characteristics.
8. Design of Self-bias circuit.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier .
12. SCR characteristics.
13. UJT Characteristics

PART C: Equipment required for Laboratories:

1. Regulated Power supplies (RPS) -0-30 V
2. CRO's -0-20 MHz.
3. Function Generators -0-1 MHz.
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) -0-20 μA, 0-50μA, 0-100μA, 0-200μA, 0-10 mA.
8. Voltmeters (Analog or Digital) -0-50V, 0-100V, 0-250V
9. Electronic Components -Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, Diodes- Ge& Si type, Transistors – NPN, PNP type)

Outcomes:
Upon completion of the Course, students will be able to:

C216.1 Determine the P-N-Junction diode & Zener diode characteristics (K3-Apply).
C216.2 Calculate the Input and Output characteristics of BJT and FET (K3-Apply).
C216.3 Evaluate Half Wave and Full Wave Rectifier with and without filters (K5-Evaluate).
C216.4 Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations (K2-Understand).
C216.5 Analyse the Frequency response of CE, CC and Common Source FET Amplifier (K4-Analyse).
C216.6 Measure SCR and UJT characteristics (K5-Evaluate).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C216.1	3	3	-	-	2	-	-	-	2	-	-	2	3	-	3
C216.2	3	3	-	-	2	-	-	-	2	-	-	2	3	-	3
C216.3	3	3	2	-	2	-	-	-	2	-	-	2	3	-	3
C216.4	3	3	2	-	2	-	-	-	2	-	-	2	3	-	3
C216.5	3	3	2	-	2.5	-	-	-	-	-	-	2	3	-	3
C216.6	3	3	2	-	2.5	-	-	-	-	-	-	2	3	-	3
C216	**3**	**3**	**2**	**-**	**2.1**	-	-	-	**2**	-	-	**2**	**3**	-	**3**

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L	T	P	C
0	0	3	1.5

(R20ECE21L2) Digital Logic Design Lab

Course Objectives: The Objective of this course is to provide the student:

- To study the theory of Boolean algebra and to studyrepresentation of switching functions using Boolean expressions and their minimization techniques.
- To study the combinational logic design of various logic and switching devices and their realization.
- To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations.
- To study some of the programmable logic devices and their use in realization ofswitching functions.
- To Explain and analyze the VHDL programming concepts for the design of digital circuits

List of Experiments :

PART – A (Implementation using Digital ICs)

1. Design and realization of Boolean Expressions using Gates
2. Design and realization of Logic Gates using Universal Gates (NAND & NOR)
3. Design and realization of Binary-Gray & Gray-Binary Converter
4. Design and realization of 4 bit Adder
5. Design and realization of 4 bit Subtractor
6. Design and realization of 4 bit comparator
7. Design and realization of 8 X 1 MUX using 2 X 1 MUX
8. Design and realization of a Synchronous and Asynchronous counter using flip-flops

PART - B

1. Introduction to VHDL Programming
2. Design and Simulation of Combinational Logic Circuits Using VHDL Realization of Logic GATEs
3. Half adder and Full adder circuits
4. Magnitude comparator
5. Encoder & Decoder
6. Binary to Gray and Gray to Binary converter
7. Parity Checker
8. Design and Simulation of sequential logic circuits using VHDL D and T Flip-Flops
9. SR and JK Flip-Flops

Major Equipments required for Laboratories:

1. 5V fixed Regulator power supply/ 0-5V or more Regulator power supply
2. 20MHz Oscilloscope with Dual Channel
3. Bread board and Components / Digital Trainer Kit
4. Multimeter

Outcomes:

Upon completion of the Course, students will be able to:

C217.1. Explain theory of Boolean Algebra & the Underlying features of various number systems. (K2-Understanding)

C217.2. Use the concepts of Boolean Algebra for the analysis &design of various combinational logic circuits. (K3-Apply)

C217.3. Use the concepts of Boolean Algebra for the analysis &design of various sequential logic circuits. (K3-Apply)

C217.4. Design various logic gates starting from simple ordinary gates to complex Programmable logic devices & arrays. (K6-Create)

C217.5. Analyze the various coding schemes are the part of the digital circuit design. (K4 -Analyse)

C217.6. Design of various circuits with the help of VHDL coding techniques. (K6-Create)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C217.1	3	3	2	-	-	2	-	-	-	-	-	-	3	3	-
C217.2	3	3	2	-	-	-	-	-	-	-	-	-	3	3	-
C217.3	3	3	3	3	2	-	-	-	-	-	-	-	3	3	-
C217.4	3	3	3	3	2	-	-	-	-	-	-	-	3	3	-
C217.5	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
C217.6	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
C217	**3**	**3**	**2.6**	**3**	**2.5**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

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L	T	P	C
0	0	2	1

(R20ECE21L3) Basic Simulation Lab

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiment are to be completed

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous / Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
9. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
10. Waveform Synthesis using Laplace Transform.
11. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and ZPlane for the given transfer function.
12. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S.Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
13. Sampling Theorem Verification.
14. Removal of noise by Autocorrelation / Cross correlation.
15. Extraction of Periodic Signal masked by noise using Correlation.
16. Checking a Random Process for Stationarity in Wide sense.

Outcomes:

Upon completion of the Course, students will be able to:

C218.1.Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals(K2-Understand)

C218.2 .Sketch Fourier spectrum by using Fourier series and Fourier transforms. (K3-Apply)

C218.3. Apply sampling theorem to reconstruct signal from its samples.(K2-Understand)

C218.4.Design a distortion less LTI system and derive filter characteristics of a system.(K6-Create)

C218.5. Determine convolution, correlation in time domain and frequency domain.(K2-Understand)

C218.6.Analyze Laplace Transforms, Fourier Transforms and Z-Transforms.(K4-Analyze)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C218.1	3	3	2	-	3	-	-	-	-	-	-	-	3	-	2
C218.2	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C218.3	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C218.4	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C218.5	3	3	3	-	3	-	-	-	-	-	-	-	3	-	3
C218.6	3	3	3	2	3	-	-	-	-	-	-	-	3	-	3
C218	**3**	**3**	**2.8**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**2.8**

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L	T	P	C
0	0	2	0

(R20MAC2100) Gender Sensitization Lab

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

UNIT – I UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1) Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT – II GENDER AND BIOLOGY Missing Women:

Sex Selection and Its Consequences (Towards a World of Equals: Unit-4) Declining Sex Ratio. Demographic Consequences. Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10) Two or Many? Struggles with Discrimination.

UNIT – III GENDER AND LABOUR Housework:

The Invisible Labour (Towards a World of Equals: Unit -3) "My Mother doesn't Work." "Share the Load." Women's Work: Its Politics and Economics (Towards a World of Equals: Unit -7) Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT – IV ISSUES OF VIOLENCE Sexual Harassment:

Say No! (Towards a World of Equals: Unit -6) Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8) Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice. Thinking about Sexual Violence (Towards a World of Equals: Unit -11) Blaming the Victim-"I Fought for my Life…." – Additional Reading: The Caste Face of Violence.

UNIT – V GENDER : CO – EXISTENCE Just Relationships:

Being Together as Equals (Towards a World of Equals: Unit -12) Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart .

Prescribed Textbook : All the five Units in the Textbook, "Towards a World of Equals: A Bilingual Textbook on Gender" written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015..

Note: Since it is an Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.

REFERENCE BOOKS:

- Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
- Abdulali Sohaila. "I Fought For My Life…and Won."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

Course Outcomes:

Upon completion of the Course, students will be able to:

219.1 Describe the important issues related to gender in contemporary India.

219.2 Predict basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.

219.3 Explain a finer grasp of how gender discrimination works in our society and how to counter it.

219.4 Show insight into the gendered division of labour and its relation to politics and economics.

219.5 Men and women students and professionals will be better equipped to work and live together as equals.

219.6 Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C219.1	-	-	-	-	-	2	2	3	-	2	-	-	3	-	2
C219.2	-	-	-	-	-	3	3	3	-	3	-	-	3	-	3
C219.3	-	-	-	-	-	3	3	3	-	3	-	-	3	-	3
C219.4	-	-	-	-	-	3	3	3	-	3	-	-	3	-	3
C219.5	-	-	-	-	-	3	3	3	-	3	-	-	3	-	3
C219.6	-	-	-	-	-	3	3	3	-	3	-	-	3	-	3
C219	**-**	**-**	**-**	**-**	**-**	**2.8**	**2.8**	**3**	**-**	**2.8**	**-**	**-**	**3**	**-**	**2.8**

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(R20MTH2201) Laplace Transforms, Numerical Methods & Complex Variables

Course Objectives: To learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Various methods to the find roots of an equation.
- Concept of finite differences and to estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
- Expansion of complex functions using Taylor's and Laurent's series.

UNIT-I: Laplace Transforms

Laplace Transforms; Laplace Transform of standard functions; first shifting theorem; Laplace transforms of functions when they are multiplied and divided by 't'. Laplace transforms of derivatives and integrals of function; Evaluation of integrals by Laplace transforms; Laplace transforms of Special functions; Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without Proof), solving ODEs by Laplace Transform method.

UNIT-II: Numerical Methods-I

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

Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

UNIT-III: Numerical Methods-II

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order.

UNIT-IV: Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT-V: Complex Variables (Integration)

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof).

Course outcomes:

After learning the contents of this paper the student must be able to

C221.1 Use the Laplace transforms techniques for solving ODE's (k3-apply)

C221.2 Calculate the root of a given Equation (k3-apply)

C221.3 Determine the value for the data using interpolation. (k3-apply)

C221.4 Evaluate the numerical solutions for a given ODE's (k5- evaluate)

C221.5 Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems (k4-analyse)

C221.6 Expand complex functions in Taylor's series & Laurent's series (k2- understand)

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

References

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C221.1	3	3	3	2	-	-	-	-	-	-	-	3	-	-	-
C221.2	3	3	3	3	-	-	-	-	-	-	-	3	-	-	-
C221.3	3	3	3	2	-	-	-	-	-	-	-	3	-	-	-
C221.4	3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
C221.5	3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
C221.6	3	3	2	3	-	-	-	-	-	-	-	2	-	-	-
C221	**3**	**3**	**2.5**	**2.3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.5**	**-**	**-**	**-**

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3	0	0	3

(R20ECE2201) Electromagnetic Theory and Transmission Lines

Course Objectives:

The course objectives are:

- To introduce the student to the fundamental theory and concepts of electromagnetic waves and transmission lines, and their practical applications.
- To study the propagation, reflection, and transmission of plane waves in bounded and unbounded media.

UNIT–I:

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT–II:

Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, 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 : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

UNIT–III:

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Illustrative Problems.

UNIT–IV:

Transmission Lines - I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading Illustrative Problems.

UNIT–V:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ2, λ/8 Lines – Impedance Transformations, Significance of Zmin and Zmax , Smith Chart Applications, Stub and Double Stub matching, Single Illustrative Problems.

TEXT BOOKS:

1. Elements of Electromagnetics – Matthew N.O. Sadiku, 4thEd., Oxford Univ.Press.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2ndEd., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCE BOOKS:

1. Engineering Electromagnetics – Nathan Ida, 2ndEd., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7thEd., 2006, TMH.
3. Electromagnetic Filed Theory and Transmission Lines – G. Sashibhushana Rao, Wiley India, 2013.
4. Networks, Lines and Fields – John D. Ryder, 2ndEd., 1999, PHI.

Course Outcomes:

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

C222.1. Differentiate the electric and magnetic field intensity ,flux density and maxwell's equations for electric and magnetic static fields (K2-Understand).

C222.2. Apply time varying maxwell's equations and their applications in electromagnetic propagation (K3-Apply).

C222.3. Select maxwell's equations to describe the propagation of electromagnetic waves in vaccume and dielectric media (K4-Analyse).

C222.4. Demonstrate the reflection and refraction of waves at boundaries (K3-Apply).

C222.5. Analyse basic transmission line parameters in phasor domain and basic wave guide operations and parameters (K4-Analyse).

C222.6. Measure the input and output impedances of transmission lines (K5-Evaluate).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C225.1	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
C225.2	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
C225.3	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
C225.4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
C225.5	3	2	3	-	-	-	3	-	-	-	-	3	3	3	-
C225.6	3	2	3	-	-	-	2	-	-	-	-	2	3	3	-
C225.7	**3**	**2.7**	**3**	**-**	**-**	**-**	**2.5**	**-**	**-**	**-**	**-**	**2.5**	**3**	**2.6**	**-**

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3	1	0	4

(R20ECE2202) Analog and Digital Communications

Course Objectives:

This course aims at:

- Developing and understanding of the design of Analog communication system.
- Study of analog modulation techniques.
- Subject will develop analytical abilities related to Circuit members.
- To understand different digital modulation techniques such as PCM, DM and various shift keying techniques.
- Understand the concepts of different digital modulation techniques.

UNIT I

Introduction to communication system, Need for modulation, Generation of AM waves, Detection of AM Waves; Double side band suppressed carrier modulators, Generation of DSBSC Waves, Detection of DSB-SC Modulated waves, COSTAS Loop.

Generation of AM SSB Modulated Wave, Demodulation of SSB Waves, Generation and detection of VSB waves. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

UNIT II

Gaussian and white noise characteristics, Noise in Analog communication System, Noise in DSB & SSB System, Noise in Angle Modulation System, Pre-emphasis & de-emphasis, Threshold effect in Angle Modulation System.

Radio Transmitter - Classification of Transmitter, AM Transmitter, FM Transmitter. Radio Receiver-Receiver Types - Tuned radio frequency receiver, Super -hetrodyne receiver, AGC, FM Receiver.

UNIT III

Pulse Modulation, Sampling Process, Generation and demodulation of PAM, PWM, PPM.

Bandwidth-S/N Tradeoff, Hartley Shannon Law. PCM Generation and Reconstruction.

Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM. Time Division multiplexing, Frequency Division multiplexing , Digital Multiplexers.

UNIT IV

Amplitude Shift Keying, Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying.

Elements of Detection Theory, Baseband Signal Receiver, Probability of Error, Optimum Filter, Matched Filter, Probability of Error for ASK, PSK, FSK.

UNIT V

Information Theory: Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise, source codings – Huffman Code, variable length coding, Source coding to Increase average Information per bit, Lossy source coding.

Spread Spectrum Modulation - Use of Spread Spectrum, Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access, Ranging using DSSS, Frequency Hopping Spread Spectrum, PN - Sequences: Generation and Characteristics, Synchronization in Spread Spectrum Systems.

TEXT BOOKS:

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education.2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems", Tata McGraw Hill,2001.

REFERENCE BOOKS:

1. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965
2. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.
3. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.
4. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005

Course Outcomes:

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

C223.1. Differentiate various elements, processes, and parameters in communication systems, and describe their functions, effects, and interrelationship (K2-Understand).

C223.2. Analyze and compare different analog modulation schemes for their efficiency and Bandwidth (K4-Analyse).

C223.3. Illustrate the behavior of a communication system in presence of noise (K3-Apply).

C223.4. Describe pulse modulation system and analyze their system performance (K4-Analyse).

C223.5. Analyze different digital modulation schemes and to compute the bit error performance (K4-Analyse).

C223.6. Understand basic knowledge of optimum demodulation of digital signals (K2-Understand).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C223.1	3	-	3	3	3	-	-	-	-	-	-	-	3	2.5	-
C223.2	3	3	-	3	2	-	-	-	-	-	-	-	3	3	-
C223.3	3	2	3	2	3	-	-	-	-	-	-	-	3	2	-
C223.4	3	2	-	3	3	-	-	-	-	-	-	-	3	2	-
C223.5	3	3	-	3	2	-	-	-	-	-	-	-	3	2	-
C223.6	3	3	-	2	3	-	-	-	-	-	-	-	3	2	-
C223	**3**	**2.6**	**3**	**2.6**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.2**	**-**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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B.Tech. - II Year – II Semester

L	T	P	C
3	0	0	3

(R20ECE2203) Linear and Digital IC Applications

Course Objectives:
The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- To understand and implement the working of basic digital circuits.

UNIT -I:

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT -II:

Op-Amp, IC-555 & IC 565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave,IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT -III:

Data Converters : Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT -IV:

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers , Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT -V:

Sequential Logic IC's and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.
Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

REFERENCE BOOKS:

1. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.
2. Operational Amplifiers with Linear Integrated Circuits by K.Lal Kishore – Pearson, 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH.
4. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
5. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005.
6. Operational Amplifiers with Linear Integrated Circuits, 4/e William D.Stanley, Pearson Education India, 2009.

Course Outcomes:

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

C224.1.Interpret the operational amplifiers with linear integrated circuits (K2-Understand).

C224.2.Demonstrate the operational amplifiers for various applications (K3-Apply).

C224.3.Describe the circuits based on analog to digital and digital to analog converters (K2-Understand).

C224.4.Describe the different families of digital integrated circuits and their characteristics (K2-Understand).

C224.5.Analyze the concepts of combinational and sequential circuits (K4-Analyse).

C224.6.Evaluate the characteristics of memory and their classification (K5-Evaluate).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C224.1	3	2	3	2	-	-	-	-	-	-	-	-	3	2	-
C224.2	3	2	3	2	-	-	-	-	-	-	-	-	3	2	-
C224.3	3	2	-	2	-	-	-	-	-	-	-	-	3	2	-
C224.4	3	2	3	2	2	-	-	-	-	-	-	-	3	3	-
C224.5	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
C224.6	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
C224	**3**	**2.3**	**3**	**2**	**2**	-	-	-	-	-	-	-	**3**	**2.5**	-

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B.Tech. - II Year – II Semester

L	T	P	C
3	0	0	3

(R20ECE2204) Electronic Circuit Analysis

Course Objective:

- To familiarize the student with the analysis and design of basic transistor amplifier circuits and their frequency response characteristics,
- To familiarize the student with the feedback amplifiers, oscillators, large signal amplifiers and tuned amplifiers

UNIT -I: Single Stage and Multi Stage Amplifiers

Single Stage Amplifiers: Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Multi Stage Amplifiers: Analysis of Cascaded RC Coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers - RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled Amplifier.

UNIT –II: BJT Amplifiers and MOS Amplifiers

BJT Amplifiers - Frequency Response: Logarithms, Decibels, General frequency considerations, Frequency response of BJT Amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors, The Hybrid- pi - Common Emitter Transistor Model, CE Short Circuit Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at higher frequencies.

MOS Amplifiers [3]: Basic concepts, MOS Small signal model, Common source amplifier with Resistive load.

UNIT –III: Feedback Amplifiers and Oscillators

Feedback Amplifiers: Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier Characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative Problems.

Oscillators: Classification of Oscillators, Conditions for Oscillations, RC Phase Shift Oscillator, Generalized analysis of LC oscillators - Hartley and Colpitts Oscillators, Wien-Bridge & Crystal Oscillators, Stability of Oscillators.

UNIT –IV: Large Signal Amplifiers : Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class-B Push-Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.

UNIT – V : Tuned Amplifier : Introduction, Q-Factor, Small Signal Tuned Amplifiers, Single Tuned Amplifiers, Double Tuned Amplifiers – effects on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers, Multivibrators, Boot-Strap Generator, Millers Circuit.

TEXT BOOKS:

1. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits, B. P. Singh, Rekha Singh, Pearson, 2013.
3. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

REFERENCE BOOKS:

1. Electronic Circuit Analysis – Rashid, Cengage Learning, 2013
2. Electronic Devices and Circuit Theory - Robert L.Boylestad, Louis Nashelsky, 9 Ed., 2008 PE.
3. Microelectric Circuits – Sedra and Smith – 5 Ed., 2009, Oxford University Press.
4. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.
5. Electronic Devices and Circuits - S. Salivahanan, N.Suresh Kumar, A Vallavaraj, 2 Ed., 2009, TMH.

Course Outcomes:

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

C225.1. Interpret the single stage amplifiers and multi stage amplifiers. (K2-Understand)
C225.2. Analyze the DC bias circuitry of BJT and FET. (K4-Analyze)
C225.3. Describe the types of amplifier operation and characteristics. (K2-Understand)
C225.4. Test the operation of oscillators.(K5-Evaluate)
C225.5. Determine efficiency of power amplifier. (K3-Apply)
C225.6. Design tuned amplifiers and bandwidth by using BJT. (K6-Create)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C225.1	3	3	3	2	3	-	-	-	-	-	-	-	3	2	-
C225.2	3	3	-	2	3	-	-	-	-	-	-	-	3	2	-
C225.3	3	3	2	3	3	-	-	-	-	-	-	-	3	2	-
C225.4	3	3	2	3	3	-	-	-	-	-	-	-	3	2	-
C225.5	3	3	-	2	3	-	-	-	-	-	-	-	3	2	-
C225.6	3	3	3	2	3	-	-	-	-	-	-	-	3	2	-
C225	**3**	**3**	**2.5**	**2.3**	**3**	-	-	-	-	-	-	-	**3**	**2**	-

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B.Tech. - II Year – II Semester

L	T	P	C
0	0	3	1.5

(R20ECE22L1) Analog and Digital Communications Lab

1. Observe the Amplitude modulated wave form & measure modulation index and demodulation of AM signal.
2. Modulate a sinusoidal signal with high frequency carrier to obtain DSB-SC signal and demodulation of the DSB-SC signal.
3. To perform the experiment of generation and detection of SSB – SC signal
4. Modulate a sinusoidal signal with high frequency carrier to obtain FM signal and demodulation of the FM signal.
5. To study the analysis of AM and FM signals using spectrum analyzer
6. To plot the characteristics of Pre-emphasis & de-emphasis circuits
7. To study the AGC Characteristics
8. To perform the experiment of generation and detection PAM
9. To perform the experiment of generation and detection PWM
10. To perform the experiment of generation and detection PWM
11. T study the Frequency Division Multiplexing & De multiplexing
12. To observe the transmission of signals over a single channel using TDM-PAM method.
13. To study the PCM modulation & demodulation
14. To study the DPCM modulation & demodulation
15. To study the Delta modulation & demodulation
16. To study the Adaptive delta modulation & demodulation
17. To perform the experiment of generation and detection of ASK
18. To perform the experiment of generation and detection of FSK
19. To perform the experiment of generation and detection of PSK
20. To perform the experiment of generation and detection of DPSK

Course Outcomes:

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

C226.1. Generate AM wave and calculate the modulation index of AM wave and predict the modulation index (β) of FM wave and simulate (K6-Create).

C226.2. Tabulate the values of gain in Pre-Emphasis&De-Emphasis and analyse and simulate various pulse modulation techniques (K4-Analyze)

C226.3. Interpret the input and output characteristics of AGC receivers and analyze simulate TDM and FDM multiplexing methods. (K4-Analyze)

C226.4. Describe the basic components of digital communication systems and base band data transmission concepts (K2-Understand)

C226.5. Analyze the error performance of the digital modulation techniques (K4-Analyze)

C226.6. Demonstrate the design of optimum receivers for the digital modulation techniques (K3-Apply)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C226.1	3	3	3	-	3	-	2	-	2	-	-	-	3	-	2
C226.2	3	3	3	-	3	-	2	-	2	-	-	-	3	-	2
C226.3	3	2	3	-	2	-	2	-	2	-	-	-	3	-	2
C226.4	2	-	3	-	3	-	2	-	2	-	-	-	3	-	2
C226.5	-	3	3	-	2	-	2	-	2	-	-	-	3	-	3
C226.6	-	2	3	-	2	-	2	-	2	-	-	-	3	-	2
C226	**2.7**	**2.6**	**3**	-	**2.5**	-	**2**	-	**2**	-	-	-	**3**	-	**2.16**

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B.Tech. - II Year – II Semester

L	T	P	C
0	0	3	1.5

(R20ECE22L2) IC Application Lab

Part-I: Linear IC Experiments

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator Circuits using IC 741.
3. Differentiator Circuits using IC 741.
4. AC Amplifier using IC 741
5. Active Filter Applications – LPF (first order)
6. Active Filter Applications – HPF (first order)
7. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
8. IC 555 Timers – Monostable and Astable Multivibrator Circuits.
9. Schmitt Trigger Circuits – using IC 741
10. IC 565 – PLL Applications.
11. Voltage Regulator using IC 723
12. Three Terminal Voltage Regulators –7805, 7809, 7912.

EQUIPMENT REQUIRED:

1 20 MHz/ 40 MHz/60 MHz Oscilloscope.
2 1 MHz Function Generator (Sine, Square, Triangular and TTL) .
3 Regulated Power Supply.
4 Multimeter / Volt Meter.

Course Outcomes:

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

C227.1.Understand the concepts of operational amplifier IC 741, Timer IC 555 & its specifications.(K2-Understand).
C227.2.Interpret the operational amplifiers with linear integrated circuits (K2-Understand).
C227.3.predict the operational amplifiers for various applications.(K3-Apply).
C227.4.Diagram illustrate the frequency response of first order HPF and LPF. (K4-Analyse).
C227.5.Sketch the circuits using operational amplifiers for waveform generator (K3-Apply).
C227.6.Calculate the pulsewidth of Mo

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C227.1	3	2	-	-	-	-	-	-	2	-	-	-	3	-	3
C227.2	3	3	2	-	-	-	-	-	2	-	-	-	3	-	2
C227.3	3	2	3	-	-	-	-	-	2	-	-	-	3	-	3
C227.4	3	-	3	3	3	-	-	-	2	-	-	-	3	-	2
C227.5	3	-	3	3	3	-	-	-	2	-	-	-	3	-	3
C227.6	3	-	3	3	3	-	-	-	2	-	-	-	3	-	3
C227	**3**	**2.3**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**2.6**

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B.Tech. - II Year – II Semester

L	T	P	C
0	0	2	1

(R20ECE22L3) Electronic Circuit Analysis Lab

List of Experiments (12 experiments to be done):

I) Design and Simulation in Simulation Laboratory using any Simulation Software. (Any 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC Coupled Amplifier
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascode Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
8. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry push pull Amplifier
10. Common Base (BJT)/ Common Gate(JFET) Amplifier
11. Multivibrators
12. Millers Circuit and Boot Strap Circuit.

II) Testing in the Hardware Laboratory (6 Experiments)

A) Any Three circuits simulated in Simulation laboratory

B) Any Three of the following

1. Class A Power Amplifier (with transformer load)
2. Class C Power Amplifier
3. Single Tuned Voltage Amplifier
4. Hartley & Colpitt's Oscillators
5. Darlington Pair
6. MOS Amplifier
7. Multivibrators
8. Millers Circuit and Boot Strap Circuit.

Equipments required for Laboratories:

1. For software simulation of Electronic circuits
   i) Computer Systems with latest specifications

ii) Connected in LAN (Optional)
iii) Operating system (Windows XP)
iv) Suitable Simulations software

2. For Hardware - simulations of Electronic Circuits
i) Regulated Power- Supply (0-30V)
ii) CRO's
iii) Functions Generators
iv) Multi Meters
v) Components

Course Outcomes:

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

C228.1 Calculate the gain and bandwidth of common emitter and common base amplifier by using BJT (K3-Analysis).
C228.2 Calculate the gain and bandwidth of common emitter and common source and common gate amplifier by using FET (K3-Analysis).
C228.3 Differentiate gain and bandwidth of the single stage and two stage RC coupled amplifiers (K2- Understand).
C228.4 Analyze the values of gain in feedback amplifiers techniques (current shunt and voltage series) (K4-Analyse).
C228.5 Differentiate the theoretical and practical values of operating frequency in oscillators using transistors (K2-Understand).
C228.6 Measure the efficiency of class A and class b power amplifiers (K5-evaluate).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C228.1	3	-	3	2	-	-	-	-	2	-	-	-	3	-	2
C228.2	3	2	3	2	2	-	-	-	2	-	-	-	3	-	2
C228.3	3	2	3	2	2	-	-	-	2	-	-	-	3	-	2
C228.4	3	3	3	2	3	-	-	-	2	-	-	-	3	-	2
C228.5	3	3	3	3	3	-	-	-	2	-	-	-	3	-	2
C228.6	3	3	3	3	3	-	-	-	2	-	-	-	3	-	2
C228	**3**	**2.6**	**3**	**2.3**	**2.6**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**2**

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B.Tech. - II Year – II Semester

L	T	P	C
3	0	0	0

(R20MAC2200) Intellectual Property Rights

UNIT – I: Introduction to Intellectual property:
Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II: Trade Marks:
Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III: Law of copy rights :
Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV: Trade Secrets:
Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V: New development of intellectual property:
New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES:

- Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
- Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tate McGraw Hill Publishing company ltd.,

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B.Tech. - III Year – I Semester

L	T	P	C
3	0	0	3

(R20MBA2201) Business Economics & Financial Analysis

Objectives:

To enable the student to understand and appreciate, with a particular insight, the importance of certain basic issues governing the business operations namely; demand and supply, production function, cost analysis, markets, forms of business organizations, capital budgeting and financial accounting and financial analysis.

Unit I

Introduction & Demand Analysis: Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

Unit II

Production & Cost Analysis: Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III

Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing: Objectives and Policies of Pricing. Methods of Pricing. Business: Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, New Economic Environment: Changing Business Environment in Post-liberalization scenario.

Unit IV

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of return (ARR) and Net Present Value Method (simple problems).

Unit V

Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions - Introduction IFRS - Double - Entry Book Keeping, Journal, Ledger, Trial Balance - Final Accounts (Trasing Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012.
4. Domnick Salvatore: Managerial Economics In a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting - A Managerial Perspective, Pearson, 2012.
6. S.N. Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha: MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J.V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

Course out comes (COs):

C311.1. Understand the market demand and supply analysis and pricing in different market structures (K2-Understand).

C311.2. Analyze hoe production functions are carried out and analyze the cost (K4-Analyse).

C311.3. understand different markets and types of business organization (K2-Understand).

C311.4. Analyze how capital budgeting decisions are carried out (K4-Analyse).

C311.5. understand the framework for both manual and computerized accounting process (K2-Understand).

C311.6. Analyze and interpret financial statements through ratio analysis (K4-Analyse).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C311.1	-	3	3	2	-	3	3	-	-	-	2	-	-	-	-
C311.2	-	3	3	2	-	3	3	-	-	-	2	-	-	-	-
C311.3	-	3	3	2	-	3	3	-	-	-	2	-	-	-	-
C311.4	-	3	3	2	-	3	3	-	-	-	2	-	-	-	-
C311.5	-	3	3	2	-	3	3	-	-	-	2.5	-	-	-	-
C311.6	-	3	3	3	-	3	3	-	-	-	2.5	-	-	-	-
C311	**-**	**3**	**3**	**2.2**	**-**	**3**	**3**	**-**	**-**	**-**	**2.1**	**-**	**-**	**-**	**-**

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B.Tech. - III Year – I Semester

L	T	P	C
3	1	0	4

(R20ECE3101) Microprocessors & Microcontrollers

Course Objective:

The course objectives are:

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers.
- To write Micro Controller Programming and to design interfacing techniques.

UNIT -I:

Introduction to 8085 Architecture-Functional diagram

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086- Common Function Signals, Timing diagrams, Interrupts of 8086.

UNIT -II:

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, Simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

UNIT -III:

I/O Interface: 8255 PPI, Various Modes of Operation and Interfacing to 8086, Interfacing Keyboard, Display, D/A and A/D Converter.

Interfacing with advanced devices: Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Communication Interface: Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

UNIT -IV:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs

UNIT -V:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

TEXT BOOKS:

1. D. V. Hall, Microprocessors and Interfacing, TMGH, 2nd Edition 2006.
2. Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning.

REFERENCE BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2nd Edition 2006.
2. The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - Liu and GA Gibson, PHI, 2nd Ed.

4. Microcontrollers and Application - Ajay. V. Deshmukh, TMGH, 2005.
5. The 8085 Microprocessor: Architecture, programming and Interfacing – K.Uday Kumar, B.S.Umashankar, 2008, Pearson
6. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

Course Outcomes:

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

C312.1 Describe the internal details of microprocessors 8086
C312.2 Interpret the various types of instruction sets of microprocessor 8086 to write programs.
C312.3 Analyze and apply different interfacing techniques to interface I/O devices with microprocessor 8086.
C312.4 Describe the internal details of microcontroller 8051
C312.5 Interpret the various types of instruction sets of microcontroller 8051 to write programs.
C312.6 Analyze and Understands the internal architecture of ARM processors

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C312.1	3	2	3	2	-	-	-	-	-	-	-	-	3	2	-
C312.2	3	3	3	2	-	-	-	-	-	-	-	-	3	3	-
C312.3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
C312.4	3	2	3	3	-	-	-	-	-	-	-	-	3	3	-
C312.5	3	3	3	3	**2**	-	-	-	-	-	-	-	3	3	-
C312.6	3	3	3	3	**3**	-	-	-	-	-	-	-	3	3	-
C312	**3**	**2.6**	**3**	**2.6**	**2.6**	-	-	-	-	-	-	-	**3**	**2.8**	-

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B.Tech. - III Year – I Semester

L	T	P	C
3	1	0	4

(R20INF3103) Data Communications and Networks

Course Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.

UNIT – I: Data Communications: Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN Physical layer: Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT – II: Data link layer: Introduction, Framing, and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. 111 Medium Access sub layer: ALOHA, CSMA/CD, LAN – Ethernet IEEE 802.3, IEEE 802.5 – IEEE 802.11, Random access, Controlled access, Channelization.

UNIT – III : Network layer: Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols.

UNIT – IV: Transport Layer: Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

UNIT – V: Application Layer: Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP.

Text books:

- Data Communications and Networking, Behrouz A. Forouzan , Fourth Edition TMH, 2006.
- Computer Networks, Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.

References:

- Computer Networking: A Top-Down Approach Featuring the Internet. James F. Kurose & Keith W. Ross, 3 rd Edition, Pearson Education.
- An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
- Understanding communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning.
- Data communications and Computer Networks, P.C .Gupta, PHI.
- Data and Computer Communication, William Stallings, Sixth Edition, Pearson Education, 2000

Course Outcomes:

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

C313.1 Understand the terminology and concepts of the OSI reference model and the TCP-IP reference model.(Understand)

C313.2 Demonstrate the transmission media, design issues and determine the CRC codes.(Apply)

C313.3 Classify the various protocols of physical layer and MAC layer.(Analyse)

C313.4 Explain the design issues, switching and evaluate the routing algorithms of network layer. (Evaluate)

C313.5Examine the various Internetworking and Internet Transport protocols.(Apply)

C313.6 Design a network based on a specified network layer protocols.(Create)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C313.1	3	1	2	3	-	3	-	-	-	-	-	-	-	-	-
C313.2	3	3	2	1	-	2	-	-	-	-	-	-	-	-	-
C313.3	2	3	2	2	-	2	-	-	-	-	-	-	-	-	-
C313.4	3	3	2	2	-	1	-	-	-	-	-	-	-	-	-
C313.5	3	3	3	2	-	1	-	-	-	-	-	-	-	-	-
C313.6	2	2	3	2	-	2	-	-	-	-	-	-	-	-	-
C313	**2.6**	**2.5**	**2.3**	**2**	**-**	**1.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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(R20EEE2202) Control Systems

Objective:

- In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life.
- The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT –I:

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

Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT -II:

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

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, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots-StabilityAnalysis.Compensation techniques – Lag, Lead and Lead -Lag Controllers design in frequency Domain, PID Controllers.

UNIT –V:

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. Control Systems Theory and Applications - S.K Bhattacharya, Pearson.
2. Control Systems - N.C.Jagan, BS Publications.

REFERENCE BOOKS:

1. Control systems - A.Ananad Kumar, PHI.
2. Control Systems Engineering - S.Palani, Tata-McGraw-Hill.
3. Control systems - Dhanesh N.Manik, Cengage Learning.
4. Control Systems Engineering - I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers.
5. Control Systems - N.K.Sinha, New Age International (P) Limited Publishers.

Course Outcomes:

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

C314.1. Classify the control systems and feedbacks (K4-Analyse)

C314.2. Sketch the block diagram of electrical systems and signal flow graphs (K3-Apply)

C314.3. Analyze the time response and transient response of first order, second order systems proportional derivative proportional integral systems stability of control systems in S- domain through RH criteria (K4-Analyse)

C314.4.Sketch the root locus by adding poles and zeros (K3-apply)

C314.5.Analyse the frequency response of system from bode plots, polar plots and nyquist plots(K4-analyse)

C314.6.Compare the state transition matrix with transfer function (K5-Evaluate)

ırse Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C314.1	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
C314.2	3	3	2	3	-	-	-	-	-	-	-	-	3	-	-
C314.3	3	3	2	3	-	-	-	-	-	-	-	-	3	-	-
C314.4	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
C314.5	3	3	2	3	3	-	-	-	-	-	-	-	3	-	-
C314.6	3	-	3	-	2	-	-	-	-	-	-	-	3	-	-
C314	**3**	**2.8**	**2.3**	**2.8**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**-**

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Professional Elective - I

(R20CSE3114) Computer Organization & Operating Systems

Course Objectives:

The course objectives are:

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.
- To demonstrate the knowledge of functions of operating system memory management scheduling, file system and interface, distributed systems, security and dead locks.
- To implement a significant portion of an Operating System.

UNIT-I:

Basic Structure of Computers: Computer Types, Functional UNIT, Basic OPERATIONAL Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions – Instruction Cycle.

Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT -II:

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control

The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual Memories Secondary Storage, Introduction to RAID.

UNIT -III:

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

UNIT -IV:

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows

Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

UNIT -V:

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

TEXT BOOKS:

1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, 3rd Edition, Pearson
3. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings 6th Edition, Pearson
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI
3. Fundamentals of Computer Organization and Design - Sivaraama Dandamudi Springer Int. Edition.
4. Operating Systems – Internals and Design Principles, Stallings, 6th Edition–2009, Pearson Education.
5. Modern Operating Systems, Andrew S Tanenbaum 2nd Edition, PHI.
6. Principles of Operating Systems, B.L.Stuart, Cengage Learning, India Edition.

Course Outcomes:

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

C315.1. Conceptually understand basic structure of computer, register transfer language and micro operations. (K2-Understanding)

C315.2 Understand working process and design of micro programmed control unit. (K2-Understanding)

C315.3. Understand concepts of memory, input-output organization. (K2-Understanding)

C315.4 Understand functions, services of operating system. (K2-Understanding)

C315.5 Understand memory management, dead lock and file management concepts. (K2 Understanding)

C315.6 Design operating system (K6-Creating)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C315.1	2	2	2	-	3	-	-	-	-	-	-	-	-	-	-
C315.2	2	2	2	-	3	-	-	-	-	-	-	-	-	-	-
C315.3	2	2	2	-	3	-	-	-	-	-	-	-	-	-	-
C315.4	2	2	3	-	3	-	-	-	-	-	-	-	-	-	-
C315.5	2	2	3	-	3	-	-	-	-	-	-	-	-	-	-
C315.6	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-
C315	**2.2**	**2.2**	**2.5**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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3	0	0	3

Professional Elective - I

(R20ECE3112) Coding Theory & Techniques

Course Objectives:

The objective of this course is:

- To understand Block Codes and Maximum Likelihood Decoding.
- To describe Decoding Tables, Hamming Weight and Distance and Error Correction vs Detection.
- To learn Binary Cyclic Codes, encoding with (n-k)-Stage Shift Register and Syndrome Calculations and Error Detection.
- To explain single error and burst error correcting codes.
- To understand BCH Codes and the encoding and decoding techniques.

UNIT-1

Coding for Reliable Digital Transmission and storage: Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT-II

Cyclic codes: Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT-III

Convolutional codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood .decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT-IV

Burst-Error-Correcting codes:

Decoding of Signle-Burst error Correcting Cyclic codes, Single-Burst-Error-Correcting Cyclic codes, Burst Error-Correcting Convoulutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes , Phased-Burst —Error-Correcting Cyclic and Convolutional codes:

UNIT V: .BCII - Codes

BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction.

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications —Shu Lin, Daniel J.Costello,Jr. Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill Publishing.

REFERENCE BOOKS:

1. Digital Communications-Fundamental and Application - Bernard sklar, PE.
2. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
3. Introduction to Error Control Codes-Salvatore Gravano-oxford
4. Error Correction Coding — Mathematical Methods and Algorithms — Todd K.Moon, 2006, Wiley India.
5. Information Theory, Coding and Cryptography — Ranjan Bose, 2nd Edition, 2009, TMH.

Course Outcomes:

After completing this course the students should be able to:

C315.1. Describe the concepts of error control strategies. (K2-understand)

C315.2. Evaluate linear block codes like syndrome calculation, minimum distance, error detection and correction of block codes.(K5-Evaluate)

C315.3. Generate Generator Matrix, Parity-Check Matrix and Error-Correcting Capability of cyclic Codes. (K6-Create)

C315.4. Analyze convolution codes and various decoding techniques.(K4-Analyse)

C315.5**.** Analyze single error and burst error correcting cyclic codes and convolution codes. (K4-Analyse)

C315.6. Understand BCH Codes and the encoding and decoding techniques. (K2-understand)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C315.1	3	-	3	3	3	-	-	-	-	-	-	-	3	2.5	-
C315.2	3	3	-	3	2	-	-	-	-	-	-	-	3	3	-
C315.3	3	2	3	2	3	-	-	-	-	-	-	-	3	2	-
C315.4	3	2	-	3	3	-	-	-	-	-	-	-	3	2	-
C315.5	3	3	-	3	2	-	-	-	-	-	-	-	3	2	-
C315.6	3	3	-	2	3	-	-	-	-	-	-	-	3	2	-
C315	**3**	**2.6**	**3**	**2.6**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.2**	**-**

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3	0	0	3

Professional Elective - I

(R20ECE3113) Electronic Measurements & Instrumentation

Course Objectives:

This course provides:

- An introduction to measurement techniques and instrumentation design and operation.
- The basic concept of units, measurement error and accuracy, the construction and design of measuring devices and circuits, measuring instruments and their proper applications.
- To use different measuring techniques and the measurement of different physical parameters using different transducers.

UNIT - I: Block Schemantics of Measuring Systems: Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II: Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

UNIT - III: Oscilloscopes: CRT, Block Schemantic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Strorage Oscilloscopes, Digital Storage CROs.

UNIT - IV: Transuducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperatue sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT - V: Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acqisition Systems.

TEXTBOOKS:

1. Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI, 5th Edition, 2003.

REFERENCES:

1. Electronic Instrumentation and Measurements - David A. Bell, Oxford Uiv. Press, 1997.
2. Electronic Measurements and Instrumentation: B. M. Oliver, J. M. Cage TMH Reprint.
3. Measurement Systems - Emest O. Doebelin and Dhanesh N Manik, 6th Ed., TMH.
4. Electronic Measurements and Instrumentations by K. Lal Kishore, Pearson Education - 2010.
5. Industrial Instrumentation: T. R. Padmanabham Spiriger 2009.

Course Outcomes:

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

C315.1. Describe the fundamental concepts and principles of instrumentation (K2 - Understanding)

C315.2. Explain the operations of the various instruments required in measurements like digital multi meter, vector voltmeter. (K2 - Understanding)

C315.3. Apply the measurement techniques for different types of tests. (K3 - Apply)

C315.4. Select specific instrument for specific measurement function.(K4 - Analyze)

C315.5. Apply knowledge of different oscilloscopes like CRO, DSO. (K3 - Apply)

C315.6. Understand functioning, specification, and applications of signal analyzing instruments. (K2 - Understanding)

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0	0	3	1.5

(R20ECE31L1) Microprocessors & Microcontrollers Lab

Note:

Minimum of 12 experiments are to be conducted.

The Following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

1 Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2 Program for sorting an array for 8086.
3 Program for searching for a number or character in a string for 8086.
4 Program for string manipulations for 8086.
5 Program for digital clock design using 8086.
6 Interfacing ADC and DAC to 8086.
7 Parallel communication between two microprocessors using 8255.
8 Serial communication between two microprocessor kits using 8251.
9 Interfacing to 8086 and programming to control stepper motor.
10 Programming using arithmetic, logical and bit manipulation instructions of 8051.
11 Program and verify Timer/ Counter in 8051.
12 Program and verify Interrupt handling in 8051
13 UART Operation in 8051.
14 Communication between 8051 kit and PC.
15 Interfacing LCD to 8051.
16 Interfacing Matrix/ Keyboard to 8051.
17 Data Transfer from Peripheral to Memory through DMA controller 8237 / 8257.

Course Outcomes:

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

C316.1. Develop the programs for 16-bit arithmetic operation, sorting, searching, string manipulations on 8086 microprocessor. (K6-Creating)
C316.2. Design and develop program for digital clock, parallel communication using 8255 and serial communication using 8251. (K6-Creating)
C316.3. Demonstrate and write program for interfacing ADC, DAC and stepper motor to 8086. (K3-apply)
C316.4. Develop the programs for arithmetic, logical and bit manipulation instructions of 8051 and verify Timer/counter, interrupt handling in 8051 microcontroller. (K6-Creating)
C316.5. Demonstrate the interfacing of LCD and Matrix/keyboard to 8051 and communication between 8051 kit and PC. (K3-apply)
C316.6. Develop the program for UART and data transfer program from peripheral to memory through DMA controller 8237/8257. (K6-Creating)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C316.1	3	2	2	3	-	-	-	-	2	-	-	-	3	-	3
C316.2	3	2	3	3	-	-	-	-	2	-	-	-	3	-	3
C316.3	3	2	3	2	-	-	-	-	2	-	-	-	3	-	3
C316.4	3	3	3	3	2	-	-	-	2	-	-	-	3	-	3
C316.5	3	3	3	2	3	-	-	-	2	-	-	-	3	-	3
C316.6	3	3	3	2	3	-	-	-	2	-	-	-	3	-	3
C316	**3**	**2.5**	**2.8**	**2.5**	**2.6**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**-**	**3**

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L	T	P	C
0	0	3	1.5

(R20INF31L2) Data Communications and Networks Lab

Course Objective: To understand communication between two desktop computers, to study about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories, to understand difference between straight cable and cross over cable.

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool
2. Study of Network Devices in Detail
3. Study of network IP.
4. Connect the computers in Local Area Network
5. Study of basic network command and Network configuration commands
6. Configure a Network topology using packet tracer software
7. Configure a Network using Distance Vector Routing protocol
8. Configure a Network using Link State Vector Routing protocol

Course Outcomes:

C317.1. Apply appropriate algorithm for the finding of shortest route. (K3-Apply)
C317.2. Develop the routing table System / Software Requirement. (K6-Create)
C317.3. Analysis the performance of various protocols in different layers. (K4-Analyze)
C317.4. Create communication between two desktop computers. (K6-Create)
C317.5. Apply appropriate algorithm for the finding of shortest route. (K3-Apply)
C317.6. Use appropriate network tools to build network topologies. (K3-Apply)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C317.1	3	2	2	3	-	-	-	-	2	2	-	-	3	-	3
C317.2	3	2	3	3	-	-	-	-	2	2	-	-	3	-	3
C317.3	3	2	3	2	-	-	-	-	2	2	-	-	3	-	3
C317.4	3	3	3	3	3	-	-	-	2	3	-	-	3	-	3
C317.5	3	3	3	2	3	-	-	-	2	2	-	-	3	-	3
C317.6	3	3	3	2	3	-	-	-	2	2	-	-	3	-	3
C317	**3**	**2.5**	**2.8**	**2.5**	**3**	**-**	**-**	**-**	**2**	**2**	**-**	**-**	**3**	**-**	**3**

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L	T	P	C
0	0	2	1

(R20HAS31L1) Advanced Communication Skills Lab

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Minimum Requirement:
The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

Prescribed Lab Manual: A book titled ***A Course Book of Advanced Communication Skills (ACS) Lab*** published by Universities Press, Hyderabad.

Suggested Software:
The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner's Compass**, 7th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**(KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

Books Recommended:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
3. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
6. English Vocabulary in Use series, Cambridge University Press 2008.

7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanne Buckely Cengage Learning 2008.
11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.
15. International English for Call Centres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

Advanced Communication Skills Lab Practicals:

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. Seminar/ Professional Presentation

2. A Report on the same has to be prepared and presented.

**** Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***

**** Not more than two students to work on each mini project.***

**** Students may be assessed by their performance both in oral presentation and written report.***

Course Outcomes:

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

C318.1. Speak effectively (Apply, K3)

C318.2. Express and communicate fluently and appropriately in social professional contexts (Apply, K3)

C318.3. The development of comprehensive ability through English language enables the students in understanding and assimilating other engineering subjects (Understand K2)

C318.4. The awareness of English lab enriches their communication and soft skills contributing to their overall development and success(Analyze, K4)

C318.5. Draft various letters and reports for all official purpose (Create K6)

C318.6. Take part in social and professional communication (Apply, K3)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C318.1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
C318.2	-	-	-	-	2	-	-	-	2	2	-	2	-	-	-
C318.3	-	-	2	-	-	-	2	-	-	-	-	-	-	-	-
C318.4	-	-	2	2	2	-	2	-	2	2	-	2	-	-	-
C318.5	-	-	-	2	2	-	-	-	2	-	-	-	-	-	-
C318.6	-	-	-	-	3	-	2	-	-	-	-	3	-	-	-
C318	**-**	**-**	**2**	**2**	**2.2**	**-**	**2**	**-**	**2**	**2**	**-**	**2.2**	**-**	**-**	**-**

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		0	**0**	**2**	**0**
(R20MAC3100) MOOCs-I					

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L	T	P	C
3	1	0	4

(R20ECE3201) Antennas and Wave Propagation

Course Objectives:

The main objectives are:

- Understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
- Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time filed.
- Aware of the wave spectrum and respective band based antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

UNIT -I:

Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front-to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

UNIT -II:

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT -III:

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics, Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types-Related Features, Illustrative Problems.

Lens Antennas: Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

UNIT -IV:

Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources **-** Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

Antenna Measurements: Introduction, Concepts – Reciprocity, Near and Far Fields, Coordinate Systems, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT -V:

Wave Propagation – I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric propagation.

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 5th ed.
2. Electromagnetic Waves and Radiating Systems-E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2009.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 4th Ed. 2017.

Course Outcomes:

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

C321.1. Explain basic terminology and concepts of Antennas (K2-Understanding).
C321.2. Discuss the basic parameters those are considered in the antenna design process and the analysis (K2-Understanding).
C321.3. Calculate the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis (K3-apply).
C321.4. Select designed antenna and field evaluation under various conditions(K4-Analyse).
C321.5. design antennas that suits the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure (K6-Creating).
C321.6. Design the bench setup for antenna parameter measurement of testing for their effectiveness (K6-Creating).

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C321.1	3	-	3	-	-	2	-	-	-	-	-	-	3	2	-
C321.2	3	2	3	-	2	2	-	-	-	-	-	-	3	3	-
C321.3	3	3	3	-	2	3	-	-	-	-	-	-	3	3	-
C321.4	3	3	2	-	2	3	-	-	-	-	-	-	3	2	-
C321.5	3	3	3	-	2	3	-	-	-	-	-	-	3	3	-
C321.6	3	3	3	-	3	3	-	-	-	-	-	-	3	2	-
C321	**3**	**2.7**	**2.8**	**-**	**2.2**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.5**	**-**

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L	T	P	C
3	1	0	4

(R20ECE3202) Digital Signal Processing

Course Objectives:

This course is an essential course that provides design techniques for processing all type of signals in various fields. The main objectives are:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete-time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- The impetus is to introduce a few real-world signal processing applications.
- To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

UNIT -I:

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, Linear Shift Invariant Systems, Stability, and Causality, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT -II:

Discrete Fourier series: DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: 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:

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT-IV:

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT-V:

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Dead Band Effects.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
3 . Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

REFERENCE BOOKS:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009
4. Discrete Systems and Digital Signal Processing with MATLAB – Taan S. EIAli, CRC press, 2009.
5. *Digital Signal Processing - A Practical approach, Emmanuel C.* **Ifeachor** *and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009.*
6. Digital Signal Processing - Nagoor Khani, TMG, 2012

Course Outcomes:

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

C322.1 Restate time, frequency and Z - transform analysis on signals and systems. (K2 Understand)
C322.2 Differentiate the inter-relationship between DFT and various transforms. (K2 Understand)
C322.3 Analyze the Fast computation of DFT and appreciate the FFT processing (K4 Analyze)
C322.4 Analyze IIR Digital Filters for a given specifications (K4 Analyze)
C322.5 Design FIR Digital filters using Window Techniques. (K6 Create)
C322.6 Evaluate the multi rate DSP techniques and finite word length effects. (K5 Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C322.1	3	3	2	-	-	2	-	-	-	-	-	-	3	2	-
C322.2	3	3	2	-	-	3	-	-	-	-	-	-	3	-	-
C322.3	3	3	3	-	-	2	-	-	-	-	-	-	3	-	-
C322.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-	-
C322.5	3	3	3	-	3	2	-	-	-	-	-	-	3	3	-
C322.6	3	3	3		3	2	-	-	-	-	-	-	3	-	-
C322	**3**	**3**	**2.6**	**-**	**2.6**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.5**	**-**

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3	1	0	4

(R20ECE3203) VLSI Design

Course Objectives:

The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

UNIT –I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT –III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV:

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

Course Outcomes:

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

C323.1. Describe the fabrication process of integrated circuit using MOS transistors. (K2-Understand)
C323.2. Choose an appropriate inverter depending on specifications required for a circuit. (K4- analyse)
C323.3. Sketch the layout and estimate parasitics of any logic circuit. (K3-Apply)
C323.4. Design different types of logic gates using CMOS inverter. (K6- Create)
C323.5. Design building blocks of datapath using gates and memories using MOS transistors. (K6-Create)
C323.6. Design Programmable logic devices and interpret the concept of testing to improve testability of system. (K6-Create)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C323.1	3	2	-	-	-	-	-	-	-	-	-	3	3	2.5	-
C323.2	3	3	3	2	-	-	-	-	-	-	-	3	3	2.5	-
C323.3	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
C323.4	3	3	3	3	-	-	-	-	-	-	-	3	3	2	-
C323.5	3	3	3	3	-	-	-	-	-	-	-	2	3	2	-
C323.6	3	3	3	3	-	-	-	-	-	-	-	2	3	2	-
C323	**3**	**2.8**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.5**	**3**	**2.3**	**-**

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3	0	0	3

Professional Elective - II
(R20ECE3221) Embedded System Design

Course Objectives:
For embedded systems, the course will enable the students to:

- Understand the basics of an embedded system
- Program an embedded system
- To learn the method of designing an Embedded System for any type of applications.
- To understand operating systems concepts, types and choosing RTOS.
- Design, implement and test an embedded system.

UNIT -I:
Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:
Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:
Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:
RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOK:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

Course Outcomes:

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

C324.1. Explain the history ,classification, characteristics, applications ,quality attributes and purpose of embedded systems(K2-Understand)

C324.2. Describe the core of the embedded systems and categorize the types of memories and memory selection sensors and actuators and communication interfaces (K2-Understand)

C324.3. Apply the various embedded systems hardware circuits and embedded firmware design approaches and Development languages (K3-Apply)

C324.4. Discuss the basics of Operating systems and RTOS and explain multitasking and multiprocessing. (K2-Understand)

C324.5. Select the task communication via shared memory Message Passing, Remote Procedure Call and Sockets and explain the Device Drivers (K4-Analyse)

C324.6. Predict the Task Communication/Synchronization Issues and Techniques, and choose an RTOS. (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C324.1	3	-	2	3	3	-	-	-	-	-	-	-	3	2	-
C324.2	3	2	3	-	2	-	-	-	-	-	-	-	3	2	-
C324.3	3	-	3	2	3	-	-	-	-	2	-	-	3	3	-
C324.4	3	2	3	-	3	-	-	-	-	2	-	-	3	3	-
C324.5	3	2	2	-	2	-	-	-	-	-	-	-	3	3	-
C324.6	3	3	2	-	3	-	-	-	-	2	-	-	3	3	-
C324	**3**	**2.2**	**2.5**	**2.5**	**2.7**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**3**	**2.7**	**-**

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B.Tech. - III Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective - II
(R20CSE4152) Internet of Things (IOT)

Course Objectives:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices

Unit – I : Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabaled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

Unit – II : IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG-NETCONF, YANG, SNMP NETOPEER

Unit – III : Introduction to Python – Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages – JSON, XML, HTTPLib, URLLib, SMTPLib

Unit – IV : IoT Physical Devices and Endpoints – Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

Unit – V : IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API.

TEXT BOOKS:

- Internet of Things – A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
- Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

Reference Books :

1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

Course Outcomes: ·

1. Able to understand the application areas of IOT
2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
3. Able to understand building blocks of Internet of Things and characteristics

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B.Tech. - III Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective - II
(R20CSE3201) Machine Learning

Course Objectives:

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research.

UNIT - I

Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

UNIT - II

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - Instance-Based Learning- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

UNIT - IV

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

UNIT - V

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators, Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming.

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH

2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis (CRC)

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.

Course Outcomes

- Student Should be we to understand the basic concepts such decision tree and neural networks.
- Ability to formulate machine learning techniques to respective problems.
- Apply machine learning algorithms to solve problems of moderate complexity.

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L	T	P	C
0	0	3	1.5

(R20ECE32L1) Digital Signal Processing Lab

Note:

- Minimum of 12 experiments are to be conducted.
- The programs shall be implemented in software (Using MATLAB / Lab view / C programming/OCTAVE Equivalent) and hardware (Using TI / Analog devices / Motorola / Equivalent DSP processors).

List of Experiments:

1. Generation of Sinusoidal waveform / signal based on recursive difference equations
2. To find DFT / IDFT of given DT signal
3. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
4. Implementation of FFT of given sequence
5. Determination of Power Spectrum of a given signal(s).
6. Implementation of LP FIR filter for a given sequence
7. Implementation of HP FIR filter for a given sequence
8. Implementation of LP IIR filter for a given sequence
9. Implementation of HP IIR filter for a given sequence
10. Generation of Sinusoidal signal through filtering
11. Generation of DTMF signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D sampling rate converters
15. Audio application such as to plot a time and frequency display of microphone plus a cosine using DSP. Read a .wav file and match with their respective spectrograms.
16. Noise removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
17. Impulse response of first order and second order systems.

Course Outcomes:

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

C326.1. Generate sinusoidal waveforms on recursive difference equation and through filtering and DTMF signals. (K6-Create)

C326.2. Sketch the characteristic of FFT of a given sequence for LP FIR,HP FIR,LP IIR,HP IIR filters.(K3-Apply)

C326.3. Calculate the DFT/IDFT of given DT signal and show the frequency response of given system. Impulse response of first order and second order systems. (K3-Apply)

C326.4. Determine the power spectrum of a given sequence. (K3-Apply)

C326.5. Diagram illustrates of Decimation, Interpolation and I/D sampling rate converters. (K4-Analyse)

C326.6. Experiment the audio application and noise removal. (K3-Apply)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C326.1	3	2	3	3	3	-	-	-	-	-	-	-	3	-	3
C326.2	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
C326.3	3	3	2	2.5	2	-	-	-	-	-	-	-	3	-	3
C326.4	3	3	3	2	3	-	-	-	-	-	-	-	3	-	3
C326.5	3	3	2	2.5	2	-	-	-	-	-	-	-	3	-	3
C326.6	3	3	2	2	2	-	-	-	-	-	-	-	3	-	3
C326	**3**	**2.8**	**2.5**	**2.5**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**-**	**3**

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B.Tech. - III Year – II Semester

L	T	P	C
0	0	3	1.5

(R20ECE32L2) VLSI & e-CAD Design Lab

Programming can be done using any compiler. Down load the programs on FPGA/CPLD boards and performance testing may be done using pattern generator (32 channels) and logic analyzer apart from verification by simulation with any of the front end tools.

1. Design of 2-to-4 decoder
2. Design of 8-to-3 encoder (without and with priority)
3. Design of 8-to-l multiplexer & 1-to-8 demultiplexer
4. Design of 4 bit binary to gray converter
5. Design of Multiplexer/ Demultiplexer, comparator
6. Design of Full adder using 3 modeling styles
7. Design of flip flops: SR, D, JK, T
8. Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter
9. Finite State Machine Design

Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:

1. Basic logic gates
2. CMOS inverter
3. CMOS NOR/ NAND gates
4. CMOS XOR and MUX gates
5. Static / Dynamic logic circuit (register cell)
6. Latch
7. Pass transistor
8. Layout of any combinational circuit (complex CMOS logic gate).

Course Outcomes:

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

C327.1. Describe Verilog hardware description languages (HDL) (K2-Understand).

C327.2. Design various logic gates using HDL. (K6-Create)

C327.3. Use the concepts of Boolean algebra for the analysis &design of various combinational logic circuits. (K3-Apply)

C327.4. Use the concepts of Boolean algebra for the analysis &design of various sequential logic circuits. (K3-Apply)

C327.5. Design Entry, simulation of flip-flop circuits with test bench & functional verification. (K6-Create)

C327.6. Describe the Finite state machine (K2-Understand).

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B.Tech. - III Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
(R20ECE32L3) Technical Seminar					

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B.Tech. - III Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**0**
(R20MAC3200) MOOCs-II					

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B.Tech. - IV Year – I Semester

L	T	P	C
3	1	0	4

(R20ECE4101) Microwave and Optical Communication

Course Objectives:

The objectives of the course are:

- To develop the knowledge on transmission lines for microwaves, cavity resonators and wave guide components and applications.
- To enable the students understand and analyze the operation of Microwave tubes like klystron, magnetron, travelling wave tube, etc.,
- To familiarize with microwave solid state devices.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To understand the design of optical systems and WDM.

Unit I : Microwave Active Devices: Gunn diode and its mode – PIN modulator - IMPATT and TRAPATT diodes - Bipolar transistor – FET – Transferred electron devices – Avalanche Transit Time Devices – Parametric amplifiers - Two cavity klystron amplifier – Power and efficiency considerations – Reflex Klystron oscillators – Modes and efficiency considerations – Magnetrons – TWT.

Unit II : Microwave Passive Devices: Waveguide corners, bends, twists, Directional couplers, Circulators, Isolators, Frequency meters, Attenuators, Wave guide Tee, Hybrid Tee, Hybrid rings (rat-race), Slotted line section, Terminator and micro wave antennas.

Unit III : Microwave Measurements: Scattering parameters – Shifting of reference planes in two port networks - S-matrix of some two-port networks – Multi port networks- Properties of S-matrix. VSWR, power, impedance, insertion loss, scattering parameters and dielectric constant measurement.

Unit IV : Optical Fibers and Devices: Propagation of light - Optical fiber structures, Acceptance angle, Numerical aperture, Attenuation, Absorption losses - Scattering losses – Dispersion – Radiation losses. Optical Source - LED, ILD characteristics. Optical detectors – PIN – APD characteristics.

Unit V : Optical Networks: Optical transmitters and receivers, System block diagram - point to point link – link design, power budget analysis. WDM- DWDM and SONET/SDH. Introduction to AON , PON and FTH.

Text Books:

1. Samuel.Y. Liao, “Microwave devices and circuits”, PHI Learning, 2003.
2. Gerd Keiser, “Optical Fiber Communications”, The McGraw Hill Companies, 4th Edition, 2008.

Reference Books:

1. K.C. Gupta, “Microwaves”, Wiley Eastern Ltd, 1983,
2. Annapoorna Das and Sisir K. Das, “Microwave Engineering”, TMH.
3. Anoop Singh, “Microwave Engineering”, PHI Learning, 2009.
4. R. F. Collins, “Foundation of Microwave Engineering”, McGraw Hill, 1987.
5. John. M. Senior, “Optical Fiber Communications Principles and Practice”, Third Edition, PHI, 2009.
6. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks – A Practical Perspective”, Harcourt Publishers International Company, 2000.

Course Outcomes:

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

C411.1. Analyze the (microwave active devices) various Microwave solid state devices, Bipolar transistors, FET, & microwave tubes. (K4- ANALYZE)

C411.2. Demonstrate the (microwave active devices) waveguide multiport junctions, ferrite devices. (K3- APPLY)

C411.3. Measure the scattering matrix and microwave parameters using Microwave Bench setup (K5- EVALUATE)

C411.4. Describe the constructional parameters of optical fibers and calculate the losses. (K3-Apply)

C411.5. Explain the optical sources and choose the optical detectors. (K4-Analyse)

C411.6. Evaluate optical system, power budget analysis and networking. (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C411.1	3	3	3	-	3	-	-	-	-	-	-	2	3	3	-
C411.2	3	2	3	3	3	-	-	-	-	-	-	2	3	2	-
C411.3	3	3	-	3	3	-	-	-	-	-	-	2	3	3	-
C411.4	3	3	-	2	3	-	-	-	-	-	-	3	3	3	-
C411.5	3	2	3	-	3	-	-	-	-	-	-	2	3	2	-
C411.6	3	3	3	3	3	-	-	-	-	-	-	2	3	3	-
C411	**3**	**2.7**	**3**	**2.7**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2.2**	**3**	**2.7**	**-**

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L	T	P	C
2	0	0	2

(R20HAS4101) Professional Practice, Law & Ethics

Unit – I : Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.

Unit – II : General Principles of Contracts Management: Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /"Red Flag" conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms;

Unit – III : Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system: Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats

Unit – IV : Engagement of Labour and Labour & other construction-related Laws: Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

Unit – V : Law relating to Intellectual property: Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies.

Text/Reference Books:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. The National Building Code, BIS, 2017
3. RERA Act, 2017
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R. (1979), Law of Contract, Oxford University Press
9. Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
11. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
12. Bare text (2005), Right to Information Act
13. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
14. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
15. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
16. Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss2,pp 117-127, MCB UP Ltd
17. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
18. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
19. Engineering Ethics, National Institute for Engineering Ethics, USA
20. www.ieindia.org
21. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
22. CONSTRUCTION CONTRACTS, http://www.jnormanstark.com/contract.htm
23. Internet and Business Handbook, Chap 4, CONTRACTS LAW, http://www.laderapress.com/laderapress/contractslaw1.html
24. Contract&Agreements http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm
25. Contracts, http://206.127.69.152/jgretch/crj/211/ch7.ppt
26. Business & Personal Law. Chapter 7. “How Contracts Arise”, http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt
27. Types of Contracts, http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt
28. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS, http://www.worldbank.org/html/opr/consult/guidetxt/types.html
29. Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02), http://www.sandia.gov/policy/14g.pdf

Goals & Outcomes:

- To familiarise the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing the profession
- To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour
- To give an understanding of Intellectual Property Rights, Patents.
- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop good ideas of the legal and practical aspects of their profession

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B.Tech. - IV Year – I Semester

L	T	P	C
3	1	0	4

Professional Elective - III
(R20ECE4131) Digital Image Processing

Course Objectives:
The objectives of the course are to:

- Provide the student with the fundamentals of digital image processing.
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field.

UNIT -I:
Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels,
Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT -II:
Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood Operation, Median Filter, Spatial Domain High-Pass Filtering.
Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT -III:
Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT -IV:
Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, Thresholding, Region Oriented Segmentation.
Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

UNIT -V:
Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
3. Fundamentals of Digital Image Processing – A.K.Jain , PHI, 1989
4. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
5. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition
6. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC Press, 2010.
7. Digital Image Processing with MATLAB & Labview – Vipula Singh, Elsevier.

Course Outcomes:

Upon successfully completing the course, the student should:

C413.1: Define basics of images and analyze the various advanced image transforms and t Properties. (K3-Apply).

C413.2: Discuss different techniques employed for the enhancement (spatial and frequency dom and restoration of images. (K2-Understanding).

C413.3: Determine degradation model and calculate various restoration techniques. (K3-Apply).

C413.4: Analyze the concepts of segmentation and various basic morphological operations in in processing. (K4-Analyse).

C413.5: Describe the various compression techniques and explain redundancies and their rem methods. (K2-understanding).

C413.6: Evaluate various compression coding techniques and compare JPEG standards. (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C413.1	3	2	-	-	-	1	-	-	-	-	-	2	3	-	-
C413.2	3	3	-	-	-	1	-	-	-	-	-	2	3	2	-
C413.3	3	3	2	-	-	2	-	-	-	-	-	2	3	-	-
C413.4	3	2	2	-	-	2	-	-	-	-	-	2	3	2	-
C413.5	3	3	2	-	-	-	-	-	-	-	-	3	3	2	-
C413.6	3	2	2	-	-	2	-	-	-	-	-	3	3	3	-
C413	**3**	**2.5**	**2**	**-**	**-**	**1.6**	**-**	**-**	**-**	**-**	**-**	**2.5**	**3**	**2.2**	**-**

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L	T	P	C
3	1	0	4

Professional Elective – III
(R20CSE4101) Cryptography and Network Security

Course Objectives:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.

UNIT – I: Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II: Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III: Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT – IV: Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT – V: E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

- Cryptography and Network Security – Principles and Practice: William Stallings, Pearson Education, 6th Edition
- Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

- Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
- Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
- Information Security, Principles, and Practice: Mark Stamp, Wiley India.
- Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
- Introduction to Network Security: Neal Krawetz, CENGAGE Learning
- Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

Course Outcomes:

Upon successfully completing the course, the Student will be able to:

C413.1 Understand basic cryptographic algorithms, message and web authentication and security issues. (K2-Understand)

C413.2 Describe information system requirements for both of them such as client and server. (K2-Understand)

C413.3 Understand the current legal issues towards information security. (K2-Understand)

C413.4 Understand the basic categories of threats to computers and networks (K2-Understand)

C413.5 Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message. (K6-Create)

C413.6 Discuss Web security and Firewalls (K2-Understand)

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L	T	P	C
3	1	0	4

Professional Elective – III
(R20CSE3122) Artificial Intelligence (AI)

Course Objectives:

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI: namely Game Playing, Theorem proving, Expert Systems, Machine Learning and Natural Language Processing

UNIT – I

Introduction: History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications
Problem Solving – State – Space Search and Control Strategies: Introduction General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction.
Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning.

UNIT – II

Login Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositions Logic, Predicate Logic, Login Programming.
Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network Extended Semantic Networks for KR, Knowledge Representation using frames.

UNIT – III

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert, Application of Expert Systems, List of Sheets and Tools.
Uncertainty Measure – Probability Theory: Introduction, Probability Theory Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory

UNIT – IV

Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning Inductive Learning, Learning Decision Trees (Text Book 2) Deductive Learning Clustering, Support Vector Machines.
Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed – Forward Networks, Multi-Layer Feed – Forward Networks Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

UNIT – V

Advanced knowledge Representation Techniques: Case Grammars Semantic Web.
Natural Language Processing: Introduction, Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking knowledge.

TEXT BOOKS:

1. Saroj Koushik, Artificial Intelligence, Cengage Learning, 2011.
2. Russell, Novig, Artificial Intelligence, A Modern Approach, Pearson Education, Second Edition, 2004.

REFERENCE BOOK:

1) Rich Knight, Nair, Artificial Intelligence, Tata McGraw Hill, Third Edition, 2009

Course Outcomes:

- Possess the ability to formulate an efficient problem space for a problem expressed in English.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique.
- Possess the ability to apply A1 techniques to solve problems of Game Paying, Expert Systems, Machine Learning and Natural Language Processing.

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L	T	P	C
3	1	0	4

Professional Elective - IV
(R20ECE4141) Cellular & Mobile Communications

Course Objectives:
The course objectives are:

- To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
- To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel
- To provide the student with an understanding of Co-channel and Non-Co-channel interferences
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
- To give the student an understanding of frequency management, Channel assignment and types of handoff.

UNIT -I:
Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.
Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT -II:
Co-Channel Interference: Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.
Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT -III:
Cell Coverage for Signal and Traffic: Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.
Cell Site and Mobile Antennas: Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

UNIT -IV:
Frequency Management and Channel Assignment: Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and

Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT -V:

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Mobile Cellular Communication - Gottapu sashibhushana Rao, Pearson, 2012.

REFERENCE BOOKS:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher,Pearson Eduction, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

Course Outcomes:

After the course the student should be able to:

C414.1. Analyse the fundamental techniques to overcome the difficult fading effects(K4-Analyse)
C414.2. Interpret the cellular concepts /Frequency reuse (K2 –Understand)
C414.3. Describe the co-channel and non co channel interferences (K2-Understand)
C414.4. Illustrate the cell coverage for signal and traffic, diversity techniques and mobile antennas (K3-Apply)
C414.5. Outline the frequency management and channel assignment (K4-Analyse)
C414.6. Explain the types of handoff and handoff's strategies (K2-Understand)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C414.1	3	2	2	-	-	-	2	-	-	-	-	2	3	2	-
C414.2	3	2	2	-	-	-	2	-	-	-	-	2	3	2	-
C414.3	3	2	3	-	-	-	2	-	-	-	-	2	3	2	-
C414.4	3	2	3	-	-	-	2	-	-	-	-	2	3	2	-
C414.5	3	2	-	-	-	-	2	-	-	-	-	2	3	3	-
C414.6	3	2	-	-	-	-	2	-	-	-	-	2	3	3	-
C414	**3**	**2**	**2.5**	-	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**3**	**2.3**	**-**

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3	1	0	4

Professional Elective – IV
(R20ECE4142) Digital Signal Processors & Architectures

Course Objectives:
The objectives of the course are:

- To recall digital transform techniques.
- To introduce architectural features of programmable DSP Processors of TI and Analog Devices.
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programming knowledge using Instruction set of DSP Processors.
- To understand interfacing techniques to memory and I/O devices.

UNIT –I:
Introduction to Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.
Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT –II:
Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III:
Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

UNIT –IV:
Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.
Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V:
Interfacing Memory and I/O Peripherals to Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. ***The Scientist and Engineer's Guide to Digital Signal Processing*** by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
6. ***Embedded Media Processing*** by David J. Katz and Rick Gentile of Analog Devices, Newnes , ISBN 0750679123, 2005.

Course Outcomes:

Upon completion of the course, the student

- Determine the fundamentals of fixed and floating point architectures of various DSP's (K3-Apply)
- Describe the knowledge & concepts of digital signal processing techniques. (K2 Understand).
- Compare the DSP computational building blocks (K5- Evaluate)
- Demonstrate the Architecture of TMS32054XX devices. (K3- Apply)
- Analyze the Architecture of ADSP2100, ADSP2181 devices. (K4- Analyze)
- Explain Memory Interfacing in DSP Devices (K2-Understand).

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L	T	P	C
3	1	0	4

Professional Elective – IV
(R20ECE4143) System on Chip Architecture

Course Objectives:

- This course introduces computer system design with emphasis on fundamental ideas, analytical techniques that are applicable to a range of applications & architectures.
- To describe the abstraction in hardware design MUO a simple processor, processor design trade off and design for low power consumption and the ACORN RISC Machine(ARM) architecture and concepts and interface with co processor.
- To use ARM instructions for programming and explain architectural support for high level language and the memory size and speed, on chip memory, cache design and memory management.

UNIT - 1

Introduction to Processor Design: Abstraction in Hardware Design, MUO a simple processor, Processor design trade off, Design for low power consumption

ARM Processor as System-on-Chip: Acorn RISC Machine - Architecture inheritance - ARM programming model -ARM development tools-3 and 5 stage pipeline ARM organization -ARM instruction execution and implementation -ARM Co-processor interface

UNIT - II:

ARM Assembly Language Programming: ARM instruction types data transfer, data processing and control flow instructions --ARM instruction set Co-processor instructions

Architectural Support for High Level Language: Data types — abstraction in Software design — Expressions — Loops - - Functions and Procedures — Conditional Statements — Use of Memory

UNIT - III:

Memory Hierarchy: Memory size and speed — On-chip memory — Caches — Cache design- an example - memory management

UNIT IV:

Architectural Support for System Development: Advanced Microcontroller bus architecture — ARM memory interface --ARM reference peripheral specification — Hardware system prototyping tools - Armulator - Debug architecture

UNIT V:

Architectural Support for Operating System: An introduction to Operating Systems —ARM system control coprocessor — CP15 protection unit registers - ARM protection unit - CP15 MMU registers — ARM MMU Architecture -- Synchronization — Context Switching input and output.

TEXT BOOKS:

1. ARM System on Chip Architecture - Steve Furber – 2nd ed., 2000, Addison Wesley Professional.
2. Design of System on a Chip: Devices and Components - Ricardo Reis, 1st ed., 2004, Springer

REFERENCE BOOKS:

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) Jason Andrews — Newnes, BK and CDROM
2. System on Chip Verification — Methodologies and Techniques —Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001 ,Kluwer Academic Publishers.

Course outcomes (COs):

After completion of the course, students will be able to:

C414.1. Describe the abstraction in hardware design MUO a simple processor, processor design trade off and design for low power consumption. (K2-Undestand)

C414.2. Explain about the ACORN RISC Machine (ARM) architecture and concepts and interface with co processor. (K2-Understand)

C414.3. Use ARM instructions for programming and explain architectural support for high level language. (K3-Apply)

C414.4. Demonstrate the memory size and speed, on chip memory, cache design and memory management. (K3-Apply)

C414.5. Diagram illustrate the advance micro controller bus architecture, memory interface, ARM reference peripheral specification, prototyping tools and debug architecture. (K4-Analyse)

C414.6 Discuss about operating systems ARM system control co processor CP15 protection unit and its registers, MMU registers architecture and context switching. (K2-Understanding)

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L	T	P	C
0	0	2	1

(R20ECE41L1) Microwave & Optical Communications Lab

Minimum Twelve Experiments to be conducted:

Part – A (Any 7 Experiments) :

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance and Frequency Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Circulator.
9. Scattering parameters of Magic Tee.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Reflex Klystron Power Supply
2. VSWR Meter -
3. Micro Ammeter - 0 – 200 µA
4. Multimeter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Reflex Klystron
8. Crystal Diodes
9. Micro wave components (Attenuation)
10. Frequency Meter
11. Slotted line carriage
12. Probe detector
13. wave guide shorts
14. Pyramidal Horn Antennas
15. Directional Coupler
16. E, H, Magic Tees
17. Circulators, Isolator
18. Matched Loads
19. Fiber Optic Analog Trainer based LED
20. Fiber Optic Analog Trainer based laser
21. Fiber Optic Digital Trainer
22. Fiber cables - (Plastic, Glass)

Course outcomes (COs):

After completion of the course, students will be able to:

C416.1. Analyze the characteristic of microwave tubes and compare them (K4- Analyze)

C416.2. Explain the various Microwave solid state devices. (K2-Understand)

C416.3. Measure the scattering matrix and microwave parameters using Microwave Bench setup (K5- Evaluate)

C416.4. Calculate the power dividing properties of various Microwave junctions, directional couplers & ferrite devices.(K3-Apply)

C416.5. Analyze the optical sources like LED and LASER diode (K4-Analyze)

C416.6. Calculate the Data rate for Digital Optical Link, NA and losses in Analog Optical Link. (K3-Apply)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C416.1	3	3	2	-	-	2	-	-	2	-	-	-	3	-	2
C416.2	3	3	3	-	-	2	-	-	-	-	-	-	3	-	3
C416.3	3	2	3	-	-	2	-	-	-	-	-	-	3	-	2
C416.4	3	2	3	-	3	3	-	-	2	-	-	-	3	-	3
C416.5	3	3	3	-	2	3	-	-	2	-	-	-	3	-	3
C416.6	3	3	3	-	3	2	-	-	2	-	-	-	3	-	3
C416	**3**	**2.6**	**2.8**	**-**	**2.6**	**2.1**	**-**	**-**	**2**	-	-	**-**	**3**	**-**	**2.6**

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B.Tech. – IV Year – I Semester		**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**
(R20ECE41L2) Comprehensive Viva-Voce					

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B.Tech. – IV Year – I Semester		**L**	**T**	**P**	**C**
		0	**0**	**0**	**2***
(R20ECE41P2) Industrial Oriented Mini Project/ Summer Internship					

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B.Tech. - IV Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective - V
(R20ECE4251) Satellite Communications

Course Objectives:
The course objectives are:

- To prepare students to excel in basic knowledge of satellite communication principles
- To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- To train the students with a basic knowledge of link design of satellite with a design examples.
- To provide better understanding of multiple access systems and earth station technology
- To prepare students with knowledge in satellite navigation and GPS and satellite packet communications

UNIT -I:
Communication Satellite: Orbit and Description: A Brief history of satellite Communication, Satellite Frequency Bands, Satellite Systems, Applications, Orbital Period and Velocity, effects of Orbital Inclination, Azimuth and Elevation, Coverage angle and slant Range, Eclipse, Orbital Perturbations, Placement of a Satellite in a Geo-Stationary orbit.

UNIT -II:
Satellite Sub-Systems: Attitude and Orbit Control system, TT&C subsystem, Attitude Control subsystem, Power systems, Communication subsystems, Satellite Antenna Equipment.
Satellite Link: Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use), Link Budget.

UNIT -III:
Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospeheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference.
Multiple Access: Frequency Division Multiple Access (FDMA) - Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA) - Frame Structure, Burst Structure, Satellite Switched TDMA, On-board Processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception.

UNIT -IV:
Earth Station Technology: Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Power Test Methods, Lower Orbit Considerations.
Satellite Navigation and Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers, GPS C/A Code Accuracy, Differential GPS.

UNIT -V:
Satellite Packet Communications: Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

TEXT BOOKS:

1. Satellite Communications –Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition, 2003, John Wiley & Sons.
2. Satellite Communications Engineering – Wilbur, L. Pritchand, Robert A. Nelson and Heuri G. Suyderhoud, 2nd Ed., Pearson Publications.
3. Digital Satellite Communications-Tri.T.Ha, 2nd Edition, 1990, Mc.Graw Hill.

REFERENCE BOOKS:

1. Satellite Communications-Dennis Roddy, 2nd Edition, 1996, McGraw Hill.
2. Satellite Communications: Design Principles – M. Richcharia, 2nd Ed., BSP, 2003.
3. Digital Satellite Communications – Tri. T. Ha, 2nd Ed., MGH, 1990.
4. Fundamentals of Satellite Communications – K. N. Raja Rao, PHI, 2004.

Course Outcomes:

After completion of the course, students will be able to:

C421.1. Describe the history, frequency allocations, applications and orbit concepts and Placement of a Satellite in a Geo-Stationary orbit (K2- Understand)

C421.2. Demonstrate satellite Subsystems like Attitude and Orbit Control system, Telemetry, Tracking, Command Satellite Antenna Equipment.(K3-Apply)

C421.3. Apply the system Noise Temperature and G/T ratio, Link and Interference Analysis, and design of satellite Links for a specified C/N, Link Budget .(K3-Apply)

C421.4. explain the different attenuations and classify the multiple access systems (K4 Analyse)

C421.5. Describe the earth station technology, Power Test Methods, Lower Orbit Considerations. Navigation and GPS (K2-Understand)

C421.6. Compare the different satellite packet communications (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C421.1	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
C421.2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
C421.3	3	2	3	2	3	-	-	-	-	-	-	2	3	3	-
C421.4	3	-	3	3	-	-	-	-	-	-	-	2	3	3	-
C421.5	3	-	-	-	-	-	-	-	-	-	-	2	3	**2**	-
C421	**3**	**2.6**	**3**	**2.5**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2.7**	**-**

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B.Tech. - IV Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective - V
(R20ECE4252) Low Power VLSI

Course Objectives:

- To expose the students to the low voltage device modeling, low voltage, low power VLSI CMOS circuit design.
- To recognize advanced issues in VLSI systems, specific to the deep-submicron silicon technologies.
- To design chips used for battery-powered systems and high performance circuits.
- This course addresses a profound analysis on the development of the CMOS & Bi-CMOS digital circuits for a low voltage low power environment

UNIT I : Low Power Design - An over View: Introduction to low- voltage low power design, limitations, Silicon-on Insulator.
MOS/BICMOS Processes: BICMOS processes, Integration and Isolation considerations, Integrated Analog/ Digital CMOS Process.

UNIT II: Low-Voltage/Low Power CMOS/ BiCMOS Processes: Deep submicron processes, SOI CMOS, lateral BJT on SOI, future trends and directions of CMOS/BiCMOS processes.

UNIT III : Device Behavior and Modeling: Advanced MOSFET models, limitations of MOSFET models, bipolar models.
Analytical and Experimental characterization of sub-half micron MOS devices, MOSFET in a Hybrid- mode environment

UNIT IV: CMOS and Bi-CMOS Logic Gates: Conventional CMOS and BICMOS logic gates. Performance evaluation
Low- Voltage Low Power Logic Circuits: Comparison of advanced BiCMOS Digital circuits. ESD-free BiCMOS, Digital circuit operation and comparative Evaluation.

UNIT V: Low Power Latches And Flip Flops: Evolution of Latches and Flip flops-quality measures for latches and flip flops, Design perspective.

TEXT BOOK:

1. CMOS/BICMOS ULSI—SI low voltage, low power by Yeo Rofail/ Gohl(3 Authors)-Pearson Education Asia l" Indian reprint,2002

REFERENCE BOOKS:

1. Digital Integrated circuits - J.M.Rabaey, PH. N.J 1996
2. CMOS Digital integrated Circuits Analysis & Design - Sung-MoKang, Yusuf Lleblebici 3rd ed., 2003. TMH 2003
2. VLSI DSP Systems K.K. Parhi, 1999, John Wiley & Sons.
3. IEEE Trans Electron Devices, IEEE J, Solid State Circuits, and other National and International Conferences and Symposia.

Course outcomes

After completion of the course, students will be able to:

C421.1. Describe various CMOS fabrication process and its modeling. (K2-Understanding)

C421.2.Understand deep submicron processes of CMOS/BICMOS technology. (K2-Understanding)

C421.3. Analyze the behavior and models of MOSFET. (K4-Analyze)

C421.4. Design the conventional CMOS/BICOMS logic circuits. (K6-Create)

C421.5. Design the low voltage and low power CMOS/BICOMS logic circuits for various applications. (K6-Create)

C421.6. Illustrate the different types of sequential, memory circuits and their design. (K3-Apply)

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B.Tech. - IV Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective - V
(R20ECE4253) Wireless Sensor Networks

Course Objectives:

- To study the fundamentals of wireless Sensor Networks
- To study the architecture and protocols of Wireless sensor networks, Challenges for Wireless Sensor Networks.
- To study the performance of MAC layer protocols of wireless networks
- To study the time synchronization and Challenges of security in Wireless sensor networks

UNIT – I : Introduction: Components of a wireless sensor node, Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Characteristics of wireless sensor networks, Challenges of wireless sensor networks, Comparison between wireless sensor networks and wireless mesh networks, Limitations in wireless sensor networks, Design challenges, Hardware architecture, Applications : Structural Health Monitoring, Traffic Control, Health Care, .Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes. Operating Systems: Functional Aspects, Nonfunctional Aspects, Prototypes, Evaluation

UNIT – II : Basic Architectural Framework: Physical Layer, Basic Components, Source Encoding, Channel Encoding, Modulation Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols

UNIT – III : Network Layer: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols Node and Network Management: Power Management, Local Power Management aspects, Dynamic Power Management, Conceptual Architecture

UNIT – IV : Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, EventDriven Localization

UNIT – V : Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks , Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and Zig Bee Security.

TEXT BOOKS:

- Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley 2010
- Mohammad S. Obaidat, Sudip Misra, "Principles of Wireless Sensor Networks", Cambridge, 2014

REFERENCE BOOKS:

- Ian F. Akyildiz, Mehmet Can Vuran , "Wireless Sensor Networks", Wiley 2010
- C S Raghavendra, K M Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer, 2010
- C. Sivarm murthy & B.S. Manoj, "Adhoc Wireless Networks", PHI-2004
- FEI HU., XIAOJUN CAO, "Wireless Sensor Networks", CRC Press, 2013
- Feng ZHAO, Leonidas GUIBAS, " Wireless Sensor Networks", ELSEVIER , 2004

Course outcomes

After completion of the course, students will be able to:

C421.1. Understand the basis of wireless sensor networks (K2-Understand).

C421.2. Illustrate the state-of-the-art in wireless sensor networks, architectures and applications (K3-Apply)

C421.3. Describe the design, frame work and the performance of MAC layer protocols of wireless sensor networks (K2-Understand).

C421.4. Analyze existing network layer protocols and routing metrics (K4- Analyze)

C421.5. Explain time Synchronization protocols in wireless sensor networks (K2-Understand).

C421.6. Interpret the fundamentals and challenges of security in wireless sensor networks (K2-Understand).

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L	T	P	C
3	0	0	3

Professional Elective - VI

(R20ECE4261) Wireless Communication & Networks

Course objectives:

The course objectives are:

- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
- To equip the students with various kinds of wireless networks and its operations.
- To prepare students to understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
- To prepare students to understand various modulation schemes and multiple access techniques that are used in wireless communications,
- To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
- To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.
- To train students to understand wireless LAN architectures and operation.
- To prepare students to understand the emerging technique OFDM and its importance in the wireless communications.

UNIT -I:

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III:

Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding,

Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

Course Outcomes:

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

C422.1. Define and explain the cellular concepts and all design fundamentals. (K2-understand)
C422.2. Demonstrate the Radio wave propagation indoor and outdoor propagation models. (K3-Apply)
C422.3. Illustrate the small scale fading and multipath measurements. (K3-Apply)
C422.4. Analyze the various Equalization & Diversity techniques used in wireless communication.(K4- Analyze)
C422.5. Describe some of the existing and emerging wireless standards. (K2-understand)
C422.6. Compare various wireless area networks and their specifications. (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C422.1	3	2	3	-	-	2	-	-	-	-	-	2	3	3	-
C422.2	3	2	3	-	2	2	-	-	-	-	-	2	3	3	-
C422.3	3	2	3	-	2	2	-	-	-	-	-	2	2	2	-
C422.4	3	-	2	-	2	2.5	-	-	-	-	-	2	2	2	-
C422.5	3	-	3	-	3	2.5	-	-	-	-	-	-	3	2	-
C422.6	3	-	-	-	-	2	-	-	-	-	-	-	3	3	-
C422	**3**	**2**	**2.8**	**-**	**2.2**	**2.1**	**-**	**-**	**-**	**-**	**-**	**2**	**2.6**	**2.5**	**-**

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Professional Elective - VI

(R20ECE4262) Electronic Product Design & Packaging

OBJECTIVES:

- To Give A Comprehensive Introduction To The Various Packaging Types Used Along With The Associated Same The Thermal, Speed, Signal And Integrity Power Issues.
- To Introduce About CAD Used In Designing Wiring Boards
- To study the Thermo-mechanical modeling and design for reliability of interconnections

UNIT I : OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING

Definition Of A System And History Of Semiconductors, Products And Levels Of Packaging, Packaging Aspects Of Handheld Products, Definition Of PWB, Basics Of Semiconductor And Process Flowchart, Wafer Fabrication, Inspection And Testing, Wafer Packaging; Packaging Evolution; Chip Connection Choices, Wire Bonding, TAB And Flip Chip.

UNIT II : SEMICONDUCTOR PACKAGES

Single Chip Packages Or Modules (SCM), Commonly Used Packages And Advanced Packages; Materials In Packages; Thermal Mismatch In Packages; Multichip Modules (MCM)-Types; System-In-Package (SIP); Packaging Roadmaps; Hybrid Circuits; Electrical Design Considerations In Systems Packaging, Resistive, Capacitive And Inductive Parasitics, Layout Guidelines And The Reflection Problem, Interconnection.

UNIT III : CAD FOR PRINTED WIRING BOARDS

Benefits From CAD; Introduction To DFM, DFR & DFT, Components Of A CAD Package And Its Highlights, Beginning A Circuit Design With Schematic Work And Component, Layout, DFM Check, List And Design Rules; Design For Reliability,Printed Wiring Board Technologies: Board-Level Packaging Aspects, Review Of CAD Output Files For PCB Fabrication; Photo Plotting And Mask Generation, Process Flow-Chart; Vias; PWB Substrates; Surface Preparation, Photoresist And Application Methods; UV Exposure And Developing; Printing Technologies For PWBs, PWB Etching; PWB Etching; Resist Stripping; Screen-Printing Technology, Hrough-Hole Manufacture Process Steps; Panel And Pattern Plating Methods, Solder Mask For PWBs; Multilayer PWBs; Introduction To, Microvias, Microvia Technology And Sequential Build-Up Technology Process Flow For High-Density, Interconnects

UNIT IV : SURFACE MOUNT TECHNOLOGY AND THERMAL CONSIDERATIONS

SMD Benefits; Design Issues; Introduction To Soldering, Reflow And Wave Soldering Methods To Attach SMDs, Solders; Wetting Of Solders; Flux And Its Properties; Defects In Wave Soldering, Vapour Phase Soldering, BGA Soldering And Desoldering/Repair; SMT Failures, SMT Failure Library And Tin Whisker, Tin-Lead And Lead-Free Solders; Phase Diagrams; Thermal Profiles For Reflow Soldering; Lead FreevAlloys, Lead-Free Solder Considerations; Green Electronics; RoHS Compliance And E-Waste Recycling, Issues, Thermal Design Considerations In Systems Packaging (L. Umanand, Thermal Design Considerations In Systems Packaging

UNIT V : EMBEDDED PASSIVES TECHNOLOGY

Introduction To Embedded Passives; Need For Embedded Passives; Design Library; Embedded Resistor Processes, Embedded Capacitors; Processes For Embedding Capacitors; Case Study Examples.

OUTCOMES:

1. Given An Electronic System PCB Or Integrated Circuit Design Specifications.
2. The Student Should Be In A Position To Recommend
3. The Appropriate Packaging Style To Be Used And Propose A Design.
4. A Design Procedure And Solution For The Same.

TEXT BOOK:

1. Rao R. Tummala, "Fundamentals Of Microsystems Packaging", McGraw Hill, NY, 2001

REFERENCE:

1. William D. Brown, "Advanced Electronic Packaging", IEEE Press, 1999.

Course outcomes:

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

C422.1. Understand why and how any semiconductor device is packaged and assembled (K2-Understand).

C422.2. Interpret inter-disciplinarity of packaging involving electrical, mechanical, thermal, materials, and processes (K2-Understand).

C422.3. Describe CAD used in designing wiring boards (K2-Understand).

C422.4. Analyze the surface mount technology, thermal design considerations in system packaging (K4- Analyze)

C422.5. Predict electronic system PCB or Integrated circuit design specifications. (K3- Apply)

C422.6. Illustrate the embedded passives and their processes (K3- Apply).

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L	T	P	C
3	0	0	3

Professional Elective - VI
(R20ECE4263) Radar Systems

Course Objectives:
The objectives of the course are:

- Radar fundamentals and analysis of the radar signals.
- To understand various technologies involved in the design of radar transmitters and receivers.
- To learn various radars like MTI, Doppler and tracking radars and their comparison.

UNIT –I:
Basics of Radar : Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

Radar Equation : SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), 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, 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, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one-and two- coordinate), Phase Comparison Monopulse, 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 Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.
Radar Receivers – Noise Figure and Noise Temperature, 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, Applications, Advantages and Limitations.

TEXT BOOKS:

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

Course Outcomes:

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

C412.1. Summarize the radar fundamentals and analysis of the radar signals. (K2 Understanding)
C412.2. Predict range performance and integration of radar (K3-apply)
C412.3. Assess Range and Doppler Effect of CW and FM-CW radar (K5-Evaluate)
C412.4. Judge the parameters of MTI and PULSE DOPPLER RADARS PERFORMANCE. (K5-Evaluate)
C412.5. Categorize various systems tracking Radar and their comparisons. (K4-analyse)
C412.6. Predict / detect various radar signals in noise and measurement of receiver parameters (K3-apply)

Course Articulation Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C412.1	2	3	3	-	3	-	-	-	-	-	-	2	2	3	-
C412.2	3	3	3	2	3	-	-	-	-	-	-	2	3	2	-
C412.3	2	3	3	2	-	-	-	-	-	-	-	2	3	3	-
C412.4	3	3	3	3	3	-	-	-	-	-	-	2	3	3	-
C412.5	3	3	3	3	3	-	-	-	-	-	-	3	3	3	-
C412.6	3	3	3	3	2	-	-	-	-	-	-	3	3	3	-
C412	**2.7**	**3**	**3**	**2.6**	**2.8**	**-**	**-**	**-**	**-**	**-**	**-**	**2.3**	**2.8**	**2.8**	**-**

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B.Tech. - IV Year – II Semester		**L**	**T**	**P**	**C**
		0	**0**	**14**	**7**
(R20ECE42P1) Project Work					

LIST OF OPEN ELECTIVES

Open Elective – I

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE3273	Consumer Electronics	3	0	0	3

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B.Tech. - III Year – II Semester	OPEN ELECTIVE- I	L	T	P	C
		3	0	0	3

(R20ECE3273) Consumer Electronics

Course Objectives:

- Students are able to understand consumer electronics fundamentals, microprocessors and microcontrollers, energy management and intelligent building perspective. Audio systems, Display systems, video systems and recording systems
- Student is able to demonstrate smart Home, Home Virtual Assistants, Home security systems and types of sensors RFID Home , kitchen electronics and smart alarms, smart toilet, smart floor and smart locks
- Students are able to discuss cordless telephones, Fax machines PDA's TABLETs Smart phones and Smart watches. Video conferencing systems, Internet enabled systems, Wi-Fi, Li-Fi, GPS and Tracking systems

UNIT I:**Consumer Electronics Fundamentals** - History of Electronic Devices- Vacuum Tubes, Transistors, Integrated Circuits- Moorse Law, Semiconductor Devices, Diodes, Rectifiers, Transistors, Logic Gates, Combinational Circuits, ADC, DAC and Microprocessors, Microprocessor Vs Microcontrollers, Microcontrollers in consumer electronics, Energy management, Intelligent Building Perspective.

UNIT II: Entertainment Electronics - Audio systems: Construction and working principle of : Microphone, Loud speaker, AM and FM receiver, stereo, 2.1 home theatre, 5.1 home theatre . Display systems: CRT, LCD, LED and Graphics displays Video Players : DVD and Blue RAY. Recording Systems: Digital Cameras and Camcorders.

UNIT III: Smart Home - Technology involved in Smart home, Home Virtual Assistants- Alexa and Google Home. Home Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and Image Sensors, PIR, IR and Water Level Sensors.

UNIT IV: **Home Appliances** - Home Enablement Systems: RFID Home, Lighting control, Automatic Cleaning Robots, Washing Machines, Kitchen Electronics- Microwave, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart toilet, Smart floor, Smart locks.

UNIT V: **Communication Systems** - Cordless Telephones, Fax Machines, PDAs- Tablets, Smart Phones and Smart Watches. Introduction to Smart OS- Android and iOS. Video Conferencing Systems- Web/IP Camera, Video security, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems.

TEXT BOOKS:

1. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018.
2. Philp Hoff "Consumer Electronics for Engineers" - Cambridge University Press.1998.
3. Jordan Frith, " Smartphones as Locative Media ", Wiley. 2014.
4. Dennis C Brewer, " Home Automation", Que Publishing 2013.
5. Thomas M. Coughlin, "Digital Storage in Consumer Electronics", Elsevier and Newness 2012.

Course Outcomes:

C325.1. summarize the consumer electronics fundamentals and explain about microprocessors and microcontrollers, energy management and intelligent building perspective (K2-Understand)

C325.2. Demonstrate Audio systems, Display systems, video systems and recording systems (K3-Apply)

C325.3. Describe the smart Home, Home Virtual Assistants, Home security systems and Different types of sensors (K2-Understand)

C325.4. Outline the home enablement systems like RFID Home, kitchen electronics and smart alarms, smart toilet, smart floor and smart locks. (K4-Analyse)

C325.5. Discuss cordless telephones, Fax machines PDA's TABLETs Smart phones and Smart watches.

C325.6. Compare and explain Android and iOS and demonstrate Video conferencing systems, Internet enabled systems, Wi-Fi, Li-Fi, GPS and Tracking systems. (K5-Evaluate)

Open Elective –II

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE4183	Principles of Modern Communication Systems	3	0	0	3
2		MOOC – III				

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B.Tech. - IV Year – I Semester **OPEN ELECTIVE - II**

L	T	P	C
3	0	0	3

(R20ECE4183) Principles of Modern Communication Systems

Course Objectives:

This course aims at:

- Establishing a firm foundation for the understanding of telecommunication systems, and the relationship among various technical factors when such systems are designed and operated
- To provide the student with an understanding of the mobile Cellular communications and their evolution.
- To equip the students with various kinds of wireless networks and its operations.
- To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- Radar fundamentals and analysis of the radar signals

UNIT I: The evolution of electronic communication: From smoke signals to smart phones - History of communications: Theoretical Foundations, Development & Applications - Frequencies for communication - Frequency regulations - Overview of communication transmitter and receiver.

UNIT II: Mobile Cellular Communications: Evolution to cellular networks – Cellular systems generations and standards: 1G, 2G, 3G, 4G - Cellular network components - Components of a mobile phone - setting up a call process - Making a call process - Receiving a call process - Spectrum allocation: Policies and strategies, Role of TRAI.

UNIT III: Wireless Communication: Introduction - Bluetooth - Infrared communication - IEEE Wireless LANs (Wi-Fi) - IEEE 802.16 (WiMaX) - Future mobile and wireless networks: Introduction to 5G- device to device communication- IoT.

UNIT IV: Satellite: History of Satellite communication, Basics of Satellites, Types of Satellites, Capacity Allocation - Launch Vehicles and Orbits: Introduction to launching vehicles, Important Orbits, working of rocket, Three Pioneers of Rocketry - Basics of Global Positioning System (GPS) - Applications of GPS.

UNIT V:RADAR& NAVIGATION: Introduction, Radar Block diagram and Operation, Radar Frequencies, Applications of Radar. Navigation Systems: Introduction & methods of navigation, Instrument Landing System, Microwave landing system- Modern Navigation systems.

REFERENCES:

1. S.Haykin, ―Communication Systems, 4/e, John Wiley 2007
2. B.P.Lathi, ―Modern Digital and Analog Communication Systems, 3/e, Oxford University Press,2007
3. Rappaport Theodore S - Wireless Communications: Principles and Practice, 2/E, Pearson
4. Education India, 2010 5. Vijay. K. Garg, ―Wireless Communication and Networking, Morgan Kaufmann Publishers, 2007.
5. T.Pratt, C. Bostian and J.Allnutt; ―Satellite Communications, John Wiley and Sons, Second Edition., 2003
6. M. I .Skolnik ―Introduction to Radar Systems, Tata McGraw Hill 2006.
7. Myron Kyton and W.R.Fried ―Avionics Navigation Systems, John Wiley & Sons 1997.

Course outcomes

After completion of the course, students will be able to:

C415.1. Differentiate various elements, processes, and parameters in communication systems, and describe their functions, effects, and interrelationship (K2-Understand).

C415.2. Interpret the mobile cellular concepts, standards and all generations of cellular systems. (K2-understand)

C415.3. Describe the existing and emerging wireless standards and Compare various wireless networks and their specifications. (K5-Evaluate)

C415.4. Demonstrate the history of Satellite communication, applications and orbit concepts, Placement of a Satellite in a Geo-Stationary orbit and GPS concept (K3- Apply)

C415.5 Summarize the radar fundamentals and analysis of the radar signals. (K4- Analyze)

C415.6 Explain the Navigation systems (K2-Understand).

Open Elective –III

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20ECE4293	Audio & Video Engineering	3	0	0	3
2		MOOC - IV				

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - IV Year – I Semester **OPEN ELECTIVE - III**

L	T	P	C
3	0	0	3

(R20ECE4293) Audio and Video Engineering

Course Objectives:

- Student are able understand different amplifiers, graphic equalizer and Dolby NR recording systems TV fundamentals like concept of aspect ratio ,image continuity etc Color theory
- Student are able to discuss composite video signal ad CCIR B standard for color signal Transmission and reception, monochrome TV transmitter and receivers, Color TV transmitter and compare TV camera tubes, Color picture tube
- Student are able Illustrate of color TV receivers(PAL-D) and Differentiate between NTSC PAL and SCAM systems cable Television, MATV, CATV, CCTV, Cable TV network and DTH

UNIT I: Hi Fi Audio Amplifier - Introduction to Amplifiers: Mono, Stereo, Public Address; Difference between stereo amplifier and Mono amplifier; Block diagram of Hi Fi amplifier and explanation; Graphic equalizer concept, circuit diagram and operation. (5 Point Circuit diagram); Dolby NR recording system; Types of speaker woofer, Midrange and Tweeter; Cross over network circuit and its function.

UNIT II: TV Fundamentals - Concept of Aspect ratio, image continuity, interlace scanning, scanning periods, horizontal and vertical, vertical resolution, horizontal resolution; Vestigial sideband transmission, bandwidth for Colour signal, picture tube, brightness, contrast, viewing distance luminance, hue, saturation, compatibility; Colour theory, primary colors and secondary colors, additive Colour mixing subtractive Colour mixing; Composite Video Signal, Pedestal height, Blanking pulse, Colour burst, Horizontal sync pulse details, Vertical sync pulse details, Equalizing pulses, CCIR B standards for Colour signal transmission and reception.

UNIT III: TV Transmitters and Receiver - Audio and Video signal transmission; Positive and Negative modulation; Merits and Demerits of Negative modulation; Introduction to television camera tube (a) Vidicon; (b) Plumbicon; (c) Solid State camera based on CCD; Color Picture tube (a) PIL, (b) Delta gun picture tube; Block diagram of monochrome TV transmitter; Block diagram of Colour TV transmitter; Block diagram of monochrome TV Receiver.

UNIT IV: Colour TV - Block Diagram and operation of color TV receiver (PAL D type); Explain – YagiUda Antenna; Explain block diagram of PAL-D decoder with circuit diagram of chroma signal amplifier, Burst pulse blanking, Colour killer control, Basic Circuit for Separation of U and V signals. AGC Amplifier.Colour signal matrixing, RGB drive amplifiers; EHT generation: circuit explanation for line output stage using transistor or IC in Colour TV; Comparisons between NTSC, PAL and SCAM Systems.

UNIT V: Cable Television - Working principle and specification of following components : Dish antenna, LNBC, Multiplexer, Attenuators Connectors (two ways and three ways), Amplifier and cable; MATV,CATV and CCTV;Design concept for cable TV network; Block diagram of dB meter with working principle; Direct to Home System (DTH) Introduction and Block Diagram.

References :

1. Television & Radio Engineering (A.M. Dhake) Tata McGraw Hill.
2. Television Engg and Video System (R.G. Gupta) Tata McGraw Hill.
3. Audio Video Systems (R.G. Gupta) Tata McGraw Hill.
4. Modern TV Pratice (R.R. Gulati) New Age International.
5. Basic Radio and Television (S. Sharma) Tata McGraw Hill.
6. Colour Television Principles and Pratice (R.R. Gulati) New Age International.
7. Basic Television and Video System (Bernard Grob) Tata McGraw Hill.
8. Mono Chrome and Colour Television (R.R. Gulati0 New Age International.
9. Modern CD Player Servicing Manual (ManoharLotia) BPB Publication.

Course Outcomes:

After completion of the course, students will be able to:

C423.1. Explain and differ ate the different amplifiers, graphic equalizer and Dolby NR recording systems (K3-apply)

C423.2. Describe the TV fundamentals like concept of aspect ratio, image continuity etc Color theory (K2-Understand)

C423.3. Discuss about composite video signal ad CCIR B standard for color signal Transmission and reception (K2-Understand)

C423.4. Discuss monochrome TV transmitter and receivers, Color TV transmitter and compare TV camera tubes, Color picture tube (K5-Evaluate)

C423.5. Diagram Illustrate of color TV receivers (PAL-D) and Differentiate between NTSC PAL and SCAM systems (K4-Analyse)

C423.6. Explain about cable Television, MATV, CATV, CCTV, Cable TV network and DTH (K2-Understand)