



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 ELECTRICAL & ELECTRONICS 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

- IM₁: Provide high quality academic programs, training activities and research facilities.**
- IM₂: Promote continuous industry – institute interaction aimed at promoting employability, entrepreneurship, leadership and research aptitude among stakeholders**
- IM₃: Contribute the economic and technological development of the region, state and Nation.**

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.



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 programme 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

ELECTRICAL & ELECTRONICS ENGINEERING

		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 IV year I semester. For the Technical 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 elective along 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 $GP \geq 5$ ('C' grade or above)
- 7.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points ($\sum CP$) 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

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

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 i^{th} 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

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

(i.e., up to and inclusive of S semesters, $S \geq 2$),

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 j^{th} 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 \geq 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA \geq 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 \geq 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.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

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 \geq 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) \geq 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 indisciplinately 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. (Lateral Entry Scheme)

ELECTRICAL & ELECTRONICS ENGINEERING

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.

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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.

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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 select from the prescribed courses (core, elective or minor or soft skill courses).

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Choice Based Credit System (CBCS)

REGULATIONS –BR20

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

Common to EEE, CSE & IT

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	R20ECH1101	Chemistry	3	1	0	4
3	R20EEE1130	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	R20HAS1102	Environmental Science	3	0	0	0
10	R20IPG1101	Induction Programme for Three Weeks	0	0	0	0
Total Credits			15	2	10	19

I YEAR II SEMESTER

COURSE STRUCTURE

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MTH1102	Mathematics – II (Advanced Calculus)	3	1	0	4
2	R20EAP1101	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	R20COI1101	Constitution of India	3	0	0	0
8	R20ITK1101	Essence of Indian Traditional Knowledge	3	0	0	0
Total Credits			16	3	10	18

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Choice Based Credit System (CBCS)

REGULATIONS –BR20

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

II YEAR I SEMESTER

COURSE STRUCTURE

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20MED2203	Fluid Mechanics & Hydraulic Machines	3	1	0	4
2	R20EEE2101	Electrical Circuit Analysis	3	1	0	4
3	R20ECE2105	Analog Electronics	3	0	0	3
4	R20EEE2102	Electrical Machines-I	3	1	0	4
5	R20EEE2103	Electro Magnetic Fields	3	0	0	3
6	R20EEE21L1	Electrical Machines Lab-I	0	0	2	1
7	R20ECE21L4	Analog Electronics Lab	0	0	2	1
8	R20EEE21L2	Electrical Circuits Lab	0	0	2	1
9	R20MAC2100	Gender Sensitization Lab	0	0	2	0
		Total Credits	15	3	8	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	R20EEE2201	Electrical Machines – II	3	1	0	4
3	R20ECE2102	Digital Logic Design	3	0	0	3
4	R20EEE2202	Control Systems	3	1	0	4
5	R20EEE2203	Power System-I	3	0	0	3
6	R20ECE21L2	Digital Logic Design Lab	0	0	2	1
7	R20EEE22L1	Electrical Machines Lab-II	0	0	2	1
8	R20EEE22L2	Control Systems Lab	0	0	2	1
9	R20MAC2200	Intellectual Property Rights	3	0	0	0
		Total Credits	18	3	6	21

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Choice Based Credit System (CBCS)

REGULATIONS – BR20

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

III YEAR I SEMESTER

COURSE STRUCTURE

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20EEE3101	Power Electronics	3	1	0	4
2	R20EEE3102	Power System-II	3	1	0	4
3	R20EEE3103	Measurements and Instrumentation	3	1	0	4
Professional Elective-I						
4	R20CSE3164	Computer Architecture	3	0	0	3
	R20EEE3111	High Voltage Engineering				
	R20EEE3112	Electric Machine Design				
	R20MAC3100	MOOCs-I				
5	R20MBA2201	Business Economics & Financial Analysis	3	0	0	3
6	R20EEE31L1	Power System Simulation Lab	0	0	2	1
7	R20EEE31L2	Power Electronics Lab	0	0	2	1
8	R20EEE31L3	Measurements and Instrumentation Lab	0	0	2	1
9	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		Open Elective-I	3	0	0	3
Professional Elective-II						
2	R20ECE3202	Digital signal processing	3	0	0	3
	R20EEE3221	Power Semiconductor Drives				
	R20EEE3222	Wind and Solar Energy systems				
	R20MAC3200	MOOCs-II				
3	R20ECE2103	Signals and Systems	2	1	0	3
4	R20ECE3101	Microprocessors & Microcontrollers	3	0	0	3
5	R20EEE3201	Power System Protection	3	1	0	4
6	R20EEE3202	Power System Operation and Control	3	0	0	3
7	R20EEE32L1	Power System Lab	0	0	2	1
8	R20ECE31L1	Microprocessors & Microcontrollers Lab	0	0	2	1
9	R20ECE32L4	Signals and Systems Lab	0	0	2	1
		Total Credits	17	2	6	22

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REGULATIONS – BR20

B. Tech. ELECTRICAL & ELECTRONICS ENGINEERING

IV YEAR I SEMESTER

COURSE STRUCTURE

S. No.	Course Code	Course Title	L	T	P	Credits
1		Open Elective-II	3	0	0	3
Professional Elective-III						
2	R20EEE4131	Digital Control systems	3	0	0	3
	R20EEE4132	Optimization Techniques				
	R20EEE4133	Electrical and Hybrid Vehicles				
Professional Elective-IV						
3	R20EEE4141	HVDC Transmission	3	1	0	4
	R20EEE4142	Power System Reliability				
	R20EEE4143	Industrial Electrical Systems				
4	R20MBA4101	Fundamentals of Management for Engineers	3	0	0	3
5	R20EEE41L1	Electrical & Electronics Design Lab	0	0	3	1.5
6	R20EEE41L2	Technical Seminar	0	0	3	1.5
7	R20EEE41P1	Industrial Oriented Mini Project/ Summer Internship	0	0	4	2
8	R20EEE41P2	Comprehensive Viva-voce	0	0	6	3
		Total Credits	12	1	16	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		Open Elective-III	3	0	0	3
Professional Elective-V						
2	R20EEE4251	Power Quality & FACTS	3	0	0	3
	R20EEE4252	Control System Design				
	R20CSE4265	AI Techniques in Electrical Engineering				
Professional Elective-VI						
3	R20EEE4261	Smart Grid Technologies	3	0	0	3
	R20EEE4262	Electrical Distribution Systems				
	R20EEE4263	Advanced Control of Electric Drives				
4	R20EEE42P1	Project Work	0	0	14	7
		Total Credits	9	0	14	16

*MC – Satisfied/Unsatisfied

LIST OF OPEN ELECTIVES**Open Elective – I**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV3271	Disaster Management & Mitigation	3	0	0	3
2	R20CSE3272	Database Concepts				
3	R20ECE3273	Consumer Electronics				
4	R20EEE3274	Electrical Estimation & Costing				
5	R20INF3275	Information Technology Essentials				
6	R20MED3276	Introduction to Robotics				
7	R20HMS3277	Fundamentals of Entrepreneurship				
8	R20HMS3278	Day to Day Biology				
9.	R20CIV3272	Building Architecture				

Open Elective –II

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV4181	Green Building Engineering	3	0	0	3
2	R20CSE4182	Fundamentals of Cyber Security				
3	R20ECE4183	Principles of Modern Communication Systems				
4	R20EEE4184	Illumination Engineering				
5	R20INF4185	E-Commerce				
6	R20MED4186	Industrial Design & Ergonomics				
7	R20HMS4187	Creative Writing				
8	R20HMS4188	Design Thinking				
9.	R20CIV4182	Pre Fabricated Structures				
10		MOOCs – III				

Open Elective –III

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV4291	Spatial Technology Concepts	3	0	0	3
2	R20CSE4292	Fundamentals of Soft Computing				
3	R20ECE4293	Audio & Video Engineering				
4	R20EEE4294	Non Conventional Energy Resources				
5	R20INF4295	Information Security Fundamentals				
6	R20MED4296	Total Engineering Quality Management				
7	R20HMS4297	Human Values & Professional Ethics for Engineers				
8	R20HMS4298	Science Fiction				
9	R20CIV4292	Building Infrastructure Auditing				
10		MOOCs - IV				

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B.Tech. - I Year – I Semester

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(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, 9th Edition, 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, 11th Reprint, 2010.
- Engineering Mathematics by M.K.Jain, S.R.K. Iyengar, Narosa Publications

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B.Tech. - I Year – I Semester

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(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 N₂ and O₂ 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, 5th 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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B.Tech. - I Year – I Semester

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(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 impart 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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B.Tech. - I Year – I Semester

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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 plumbing, 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, Rectifiers, 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:

1. Workshop Practice /B. L. Juneja / Cengage
2. 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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B.Tech. - I Year – I Semester

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(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

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- 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, Places, Process 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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B.Tech. - I Year – I Semester

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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 Fe²⁺ by Potentiometry using K₂Cr₂O₇ / KMnO₄.
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 5th 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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B.Tech. - I Year – I Semester

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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.

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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(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:** Climate 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, 4th 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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**(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} , $\sin ax$, $\cos ax$, 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, 9th Edition, 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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(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 (CO₂) 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 Learning.
- 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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(R20CSE1101) PROGRAMMING FOR PROBLEM SOLVING

Course Objectives:

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

Course Outcomes: The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- 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, (3rd 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 (16th Impression)
- c) Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
- d) Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
- e) E. Balaguruswamy, Programming in ANSI C, Tata McGraw - Hill

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(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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(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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(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

$$5 \times 2 = 10$$

$$5 \times 3 = 15$$

- 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: $1 + x + x^2 + x^3 + \dots + x^n$. 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 first 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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(R20MED2203) Fluid Mechanics & Hydraulic Machines

Course Objectives:

1. To develop a concept of fluid and an understanding of Continuum model of fluid motion
2. Development of basic concepts of continuum mechanics like localized force distributions, Eulerian and Lagrangian frames of reference and mathematical derivatives.
3. Development of principles of fluid statics and their applications.
4. To provide knowledge of kinematic aspects of fluid motion and basic methods of flow visualization.
5. Development of tools for analysis of fluid motions using Finite Control Volume approach.
6. To provide basic knowledge of incompressible flow in circular pipes and exposure to design problems involving piping systems.
7. To develop basic concepts of compressible flow and development of Quasi-1D isentropic flow theory for variable area flow passages.
8. Analysis of Normal Shock waves.

UNIT – I

Fluid statics: Dimensions and units: physical properties of fluids. Specific gravity, viscosity, surface tension vapour pressure and their Influence on fluid motion – atmospheric, gauge and vacuum pressures- measurement of pressure – Piezometer, U-tube and differential manometers.

UNIT – II

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows – steady & unsteady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows – equation of continuity for one dimensional flow and three dimensional flows.

Fluid dynamics: Surface and body forces – Euler’s and Bernoulli’s equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT – III

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

Closed conduit flow: Reynold’s experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line hydraulic gradient line. Measurement of flow: pitot tube, venturimeter, and orifice meter, Flow nozzle

UNIT – IV

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip. Velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines. Heads and efficiencies impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine – working proportions, work done, efficiencies, hydraulic design draft tube theory – functions and efficiency.

Performance of Hydraulic Turbines: Geometric similarity, Unit and specific quantities,

characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT – V

Centrifugal Pumps: Classification, working, work done – barometric head losses and efficiencies specific speed – performance characteristic curves, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiyah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Course Outcomes:

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

1. Generate mathematical models of fluid motion including steady and unsteady flow.
2. Recite fluid properties and fluid statics.
3. State and visualize fluid kinematics.
4. Predict and design a fluid dynamical system based on inviscid theory.
5. Model compressible flow systems.
6. Design of hydraulic Impulse, Francis, Kaplan turbines and design of centrifugal and reciprocating pumps and their specifications , working principles and their characteristics
7. To understand boundary layer concepts, types of losses in pipes and measurement of flow.
8. Able to understand basics of turbo machines, pelton wheel, francis turbine and Kaplan turbine.
9. Centrifugal and Reciprocating pumps.

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(R20EEE2101) Electrical Circuit Analysis

Objective:

This course deals with

- Understanding the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline.
- The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, theorems and network topology.

UNIT –I:

Introduction to Electrical Circuits: Source Transformation, Voltage – Current relationship for Passive Elements (for different input signals –Square, Ramp, Saw tooth and Triangular). Star –to-Delta or Delta-to-Star Transformations, Nodal Analysis, Mesh Analysis, Super node and Super mesh for DC Excitations – Super position, Reciprocity, Thevenins, Nortons, Maximum power transfer, Millimans, Compensation Theorems to A.C. Excitations.

UNIT –II:

A.C. Circuits: R.M.S. and Average values and form factor for different periodic wave forms, Steady State Analysis of R, L and C (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, Concept of Reactance, Impedance, Susceptance and Admittance, Phase and Phase difference, Concept of Power Factor, Real and Reactive powers, J-notation, Complex and Polar forms of representation, Complex power.

Locus diagrams, Resonance : Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters - Resonance-series, parallel circuits, concept of band width and Q factor.

UNIT –III:

Magnetic circuits: 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 cutset and Basic Tie set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Dependent & Independent Voltage and Current Sources, Duality & Dual Networks.

UNIT –IV:

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

UNIT –V:

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

TEXT BOOKS:

1. Electric Circuits - A.Chakrabarhty, Dhanipat Rai & Sons.
2. Network analysis - N.C Jagan and C. Lakhminarayana, BS publications.

Outcomes:

- Apply the basics of circuit analysis
- To understand the concept of elements, input signals, circuit laws , reduction techniques and star to delta transformation
- Knowledge in analysis of AC circuits for all combinations ,concept of phasor and power analysis.
- To know the basics of magnetic circuits, resonance in series and parallel circuits.
- Knowledge about the concepts of graph theory, analysis of networks using topology
- To solve electrical networks of both AC and DC by applying theorems.

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(R20ECE2105) Analog Electronics

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, Comparison 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 V_{BE} 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:

- Describe the construction, operation and characteristics of electronic devices like P-N-Junction and special Purpose diodes.
- Determine the application of diode as a rectifier
- Illustrate the application of transistors as amplifier employing BJT devices
- Analyse the Biasing circuits using BJT Transistor Amplifier Circuit
- Evaluate construction, operation and characteristics of FET
- Select Biasing circuits using FET Amplifiers

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(R20EEE2102) Electrical Machines-I

Course Objectives:

- To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
- To analyze performance aspects of various testing methods.

UNIT – I

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E.M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compound generators.

UNIT – II

D.C Motors: Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3-point and 4-point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT – III

Testing of DC Machines: Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne’s test – Hopkinson’s test – Field’s test - separation of stray losses in a d.c. motor test.

UNIT – IV

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses.

UNIT – V

Testing of Transformers and Poly-Phase Transformers: OC and SC tests - Sumpner’s test - predetermination of efficiency and regulation-separation of losses test-parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers – Poly-phase connections - Y/Y, Y/ Δ Δ /Y, Δ / Δ , and open Δ .

TEXT BOOKS:

1. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

REFERENCE BOOKS:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

Course Outcomes: At the end of this course, students will demonstrate the ability to :

- Identify different parts of a DC machine & understand its operation
- Carry out different testing methods to predetermine the efficiency of DC machines
- Understand different excitation and starting methods of DC machines
- Control the voltage and speed of a DC machines
- Analyze single phase and three phase transformers circuits.

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(R20EEE2103) Electro Magnetic Fields

Objective:

- To provide the basic skills required to understand, develop, and design various engineering applications involving electromagnetic fields.
- To lay the foundations of electromagnetism and its practice in modern communications such as wireless, guided wave principles such as fiber optics and electronic electromagnetic structures.

UNIT – I:

Electrostatics: Electrostatic Fields – Coulomb’s Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Gauss’s law – Application of Gauss’s Law – Maxwell’s first law, $\text{div} (D) = \rho$ Laplace’s and Poisson’s equations – Solution of Laplace’s equation in one variable.

UNIT – II:

Conductors, Dielectrics and Capacitance: Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators. Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel plate and spherical and coaxial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm’s law in point form – Equation of continuity.

UNIT – III:

Magneto Statics: Static magnetic fields – Biot-Savart’s law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell’s second Equation, $\text{div}(\mathbf{B})=0$. **Ampere’s circuital law and its applications:** viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere’s circuital law – Maxwell’s third equation, $\text{Curl} (\mathbf{H})=\mathbf{J}_c$, Field due to a circular loop, rectangular and square loops.

UNIT-IV:

Force in Magnetic Fields And Magnetic Potential : Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field. Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson’s equations. Self and Mutual inductance – Neumann’s formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

UNIT – V:

Time Varying Fields : Time varying fields – Faraday’s laws of electromagnetic induction – Its integral and point forms – Maxwell’s fourth equation, $\text{Curl} (\mathbf{E})=- \mathbf{B} / t$ – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell’s equations for time varying fields – Displacement current .

TEXT BOOKS:

1. "Engineering Electromagnetics" William H. Hayt & John. A. Buck McGraw-Hill Companies.
2. "Electro magnetic Fields", Sadiku, Oxford Publications.

REFERENCES:

1. "Introduction to Electro Dynamics", D J Griffiths, Prentice-Hall of India Pvt.Ltd.
2. "Electromagnetic Fields", Y Mallikarjuna Reddy, Universities Press.
3. "Electromagnetics", J. D Kraus Mc Graw-Hill companies.
4. "Electromagnetism-Problems with solutions", Ashutosh Pramanik, PHI Learning.
5. "Electromagnetics-Problems and solutions", William H. Hayt & John. A. Buck McGraw-Hill Companies.

Outcome:

After study through lectures and assignments, students will be able to:

- Should be able to specify the "constitutive relationships" for fields and understand why they are required.
- Apply vector calculus to static electric-magnetic fields in different engineering situations.
- Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
- Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.
- Analyze the nature of electromagnetic wave propagation in guided medium which are used in microwave applications.
- Experimental measurement of voltages induced by time varying magnetic flux. Flux determination.

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(R20EEE21L1) Electrical Machines Lab-I

Objectives:

- Understanding the basic theory and operation of electrical machines.
- Understanding how electrical machines fit into the larger context of power systems.
- Understanding and using procedures and analysis techniques to perform and describe electromagnetic and electromechanical tests on electrical machines.

The following experiments are required to be conducted compulsory experiments

1. Magnetization characteristics of DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC series generator.
4. Load test on DC compound generator.
5. Hopkinson's test on DC shunt machines.
6. Fields test on DC series machines.
7. Swinburne's test and speed control of DC shunt motor..
8. Brake test on DC compound motor.

In addition to the above eight Experiments, at least any two of the experiments from the following list are required to be conducted:

9. Brake test on DC shunt motor.
10. Retardation test on DC shunt motor.
11. Separation of losses in DC shunt motor.

Outcomes:

- Have knowledge of various parts of a electrical machine.
- Develop knowledge helpful for application of dc machines.
- Ability to conduct speed control of different types of DC Motors.
- Ability to test for characteristics of various generators depending on their type of field excitation.
- Ability to understand the concept of different types of windings viz lap and wave for armature.
- Ability to perform test on Motor-Generator Set.
- To know the concept of commutation dc machines for conversion of Ac to Dc or Dc to Ac.

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(R20ECE21L4) Analog Electronics 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 μ A, 0-50 μ A, 0-100 μ A, 0-200 μ A, 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:

- Determine the P-N-Junction diode & Zener diode characteristics.
- Calculate the Input and Output characteristics of BJT and FET.
- Evaluate Half Wave and Full Wave Rectifier with and without filters.
- Differentiate Measurement of h-parameters of transistor in CB, CE, CC configurations.
- Analyse the Frequency response of CE, CC and Common Source FET Amplifier.
- Measure SCR and UJT characteristics.

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(R20EEE21L2) Electrical Circuits Lab

Course Objective(s):

- To verify the network theorems.
 - To study resonance characteristics
 - To determine 2-port network parameters
- 1) Verification of Thevenin's, and Norton's Theorems
 - 2) Verification of Superposition and Maximum Power Transfer Theorems
 - 3) Verification of RMS value of complex wave
 - 4) Verification of Compensation Theorem
 - 5) Verification of Reciprocity, Millmann's Theorems
 - 6) Locus Diagrams of RL and RC Series Circuits
 - 7) Series and Parallel Resonance
 - 8) Determination of Self, Mutual Inductances and Coefficient of coupling
 - 9) Determination of Z and Y Parameters
 - 10) Determination of Transmission line and hybrid parameters
 - 11) Measurement of Active Power for Star and Delta connected balanced loads
 - 12) Measurement of Reactive Power for Star and Delta connected balanced loads
 - 13) Measurement of 3-phase Power by two - Wattmeter Method for unbalanced loads

Outcomes:

- Understand the concept of Theorems.
- Solve AC And DC Circuits.
- Understand the concept of Resonance.
- Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter Model and solve the circuits.
- To analyze and calculate the coefficient of coupling.
- Measure three phase voltages and currents, active, reactive powers

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(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.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to 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.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- 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.

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/>

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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 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)

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

- Use the Laplace transforms techniques for solving ODE's
- Find the root of a given equation.
- Estimate the value for the given data using interpolation
- Find the numerical solutions for a given ODE's
- Analyse the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems
- Taylor's and Laurent's series expansions of complex function

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(R20EEE2201) Electrical Machines – II

Course Objectives:

- To deal with the detailed analysis of poly-phase induction motors & Alternators.
- To understand operation, construction and types of single-phase motors and their applications in house hold appliances and control systems.
- To introduce the concept of parallel operation of alternators
- To introduce the concept of regulation and its calculations.

Unit I

Poly-Phase Induction Machines: Constructional details of cage and wound rotor machines- production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation.

Unit II

Characteristics of Induction Machines: Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging -No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

Unit III

Synchronous Machines: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators.

Unit IV

Parallel Operation of Synchronous Machines: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's. Synchronous Motors: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression – Methods of starting – synchronous induction motor.

Unit V

Single Phase & Special Machines: Single phase induction motor – Constructional features-Double revolving field theory – split-phase motors – shaded pole motor.

TEXT BOOKS:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.

REFERENCE BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the concepts of rotating magnetic fields.
2. Understand the operation of ac machines.
3. Analyze performance characteristics of ac machines.

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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

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

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:

- Interpret the various number systems & code converters, error detecting and correcting, BCD, Gray Code, EX-3.
- Describe the operation of logic gates and Apply Boolean Algebra on K-map.
- Design / Analysis of Combinational Circuits.
- Diagram illustrates the operation & timing constrains for Latches & Flip-Flops and Registers and Counters.
- Design & analyze sequential circuits.
- Use HDL & appropriate EDA tools for digital logic design & simulation.

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B.Tech. - II Year – II Semester

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(R20EEE2202) Control Systems

Course Objectives :

In this course it is aimed to deal with

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

UNIT - I:

Introduction to Control Problem: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.

UNIT - II:

Time Response Analysis of Standard Test Signals: Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for secondorder systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT- III:

Frequency-Response Analysis: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

UNIT - IV:

Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNIT - V:

State Variable Analysis and Concepts of State Variables: State space model. Diagonalization of State Matrix. Solution of state equations. Eigen values and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

TEXT BOOKS:

1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.

REFERENCE BOOKS:

1. Ogata, “Modern Control Engineering”, Prentice Hall, 1991.
2. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

Course Outcomes: At the end of this course, students will demonstrate the ability to

1. Understand the modeling of linear-time-invariant systems using transfer function and statespace representations.
2. Understand the concept of stability and its assessment for linear-time invariant systems.
3. Design simple feedback controllers.

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B.Tech. - II Year – II Semester

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(R20EEE2203) Power System-I

Course Objectives:

- To understand the different types of power generating stations.
- To examine A.C. and D.C. distribution systems.
- To understand and compare overhead line insulators and Insulated cables.
- To illustrate the economic aspects of power generation and tariff methods.
- To evaluate the transmission line parameters calculations
- To understand the concept of corona.

UNIT - I

Generation of Electric Power

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant. **Non-Conventional Sources (Qualitative):** Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage.

UNIT - II

Economics of Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT - III

Overhead Line Insulators & Insulated Cables: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators. Introduction, insulation, insulating materials, Extra high voltage cables, grading of cables, insulation resistance of a cable, Capacitance of a single core and three core cables, Overhead lines versus underground cables, types of cables.

UNIT - IV

Inductance & Capacitance Calculations of Transmission Lines: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance. Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-V

A.C. Distribution: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages. DC Distribution: Classification of Distribution Systems.- Comparison of DC vs. AC and Under-Ground vs. Over- Head Distribution

Systems.- Requirements and Design features of Distribution Systems.- Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

TEXT BOOKS:

1. W.D.Stevenson –Elements of Power System Analysis, Fourth Edition, McGraw Hill, 1984.
2. C.L. Wadhwa –Generation, Distribution and Utilization of Electrical Energy, Second Edition, New Age International, 2009.

REFERENCE BOOKS:

1. C.L. Wadhwa –Electrical Power Systems, Fifth Edition, New Age International, 2009
2. M.V. Deshpande –Elements of Electrical Power Station Design, Third Edition, Wheeler Pub. 1998
3. H.Cotton& H. Barber-The Transmission and Distribution of Electrical Energy, Third “V.K Mehta and Rohit Mehta”, “Principles of Power Systems”, S. Chand& Company Ltd, New Delhi, 2004.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the concepts of power systems.
- Understand the operation of conventional generating stations and renewable sources of electrical power.
- Evaluate the power tariff methods.
- Determine the electrical circuit parameters of transmission lines
- Understand the layout of substation and underground cables and corona.

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B.Tech. - II Year – II Semester

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(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 study representation 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 of switching functions.
- To Explain and analyze the VHDL programming concepts for the design of digital circuits

List of Experiments :

PART – A

1. Design and realization of Not Gate
2. Design and realization of AND Gate
3. Design and realization of OR Gate
4. Design and realization of NAND Gate
5. Design and realization of NOR Gate
6. Design of Half Adder and Full Adder
7. Design of Half Subtractor and Full Subtractor

PART – B

8. Introduction to VHDL Programming
9. XILINX ISE QUICK Start Tutorial
10. Design and Simulation of Combinational Logic Circuits Using VHDL Realization of Logic GATES
11. Half adder and Full adder circuits
12. Magnitude comparator
13. Encoder & Decoder
14. Binary to Gray and Gray to Binary converter
15. Parity Checker
16. Design and Simulation of sequential logic circuits using VHDL D and T Flip-Flops
17. 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:

- Explain theory of Boolean Algebra & the Underlying features of various number systems.
- Use the concepts of Boolean Algebra for the analysis & design of various combinational logic circuits.
- Use the concepts of Boolean Algebra for the analysis & design of various sequential logic circuits.
- Design various logic gates starting from simple ordinary gates to complex Programmable logic devices & arrays.
- Analyze the various coding schemes are the part of the digital circuit design.
- Design of various circuits with the help of VHDL coding techniques.

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(R20EEE22L1) Electrical Machines Lab-II

Objective : In this lab students

- Understanding the performance of single phase transformer, parallel operation of transformer.
- Understanding the performance of induction motor, regulation of alternator and equivalent circuit of single phase induction motor.

The following experiments are required to be conducted as compulsory experiments:

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. Break test on three-phase Induction Motor.
4. No-load & Blocked rotor tests on three - phase Induction motor
5. Regulation of a three - phase alternator by synchronous impedance & m.m.f. methods
6. **V** and **Inverted V** curves of a three - phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Determination of **X_d** and **X_q** of a salient pole synchronous machine

In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:

1. Parallel operation of Single phase Transformers
2. Separation of core losses of a single phase transformer
3. Scott connection of transformers
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Efficiency of a three-phase alternator
6. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
7. Measurement of sequence impedance of a three-phase alternator.

Outcomes:

- To Understanding principles of AC machines.
- Find role of electrical machinery pertaining to Synchronous machines, Single phase motors in simple applications.
- Articulate rotating magnetic generation
- Calculate machine variables in direct and quadrature axis form
- Express working of single and three phase AC Machines
- Know the concept of harmonics created in supply systems, need for reduction and design of Synchronous machines for reducing them.

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(R20EEE22L2) Control Systems Lab

Objective:

To familiarize with the modeling of dynamical systems and the characteristics of control components like ac servo motor, synchro and magnetic amplifier.

1. Time response of Second order system
2. Characteristics of Synchros.
3. Programmable logic controller - Study and verification of truth tables of logic gates, simple Boolean expression and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation— Magnitude and phase plot
8. Transfer function of DC generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor

Outcomes:

- Find time response of given control system model.
- To understand the characteristics of synchros.
- Study and verification of truth tables of logic gates, simple Boolean expression and application of speed control of motor.
- To analyze the feedback of servo motor.
- Formulate transfer function for given control system problems.
- Design PID controllers for given control system model
- Design Lead, Lag, Lead-Lag systems in control systems.
- To understand characteristics of magnetic amplifier.

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B.Tech. - II Year – II Semester

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(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

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(R20EEE3101) Power Electronics

Objective:

- To introduce students to the basic theory of power semiconductor devices and passive components, their practical applications in power electronics.
- To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications.
- To provide strong foundation for further study of power electronic circuits and systems.

UNIT - I:

Power Semi Conductor Devices & Communication Circuits: Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points. Two transistor analogy – SCR - UJT firing circuit — Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutation circuits.

UNIT - II:

AC-DC Converters (1-Phase & 3-Phase Controlled Rectifiers): Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Free wheeling Diode –Numerical problems. Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load– Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Free wheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems. Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms – Numerical Problems.

UNIT - III:

DC-DC Converters (Choppers):

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression, Jones chopper, AC Chopper, Problems.

UNIT - IV:

AC-AC Converters (AC Voltage Controllers) & Frequency Changers (Cyclo-Converters): AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits -Numerical problems -Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms.

UNIT - V:

DC-AC Converters (Inverters): Inverters – Single phase inverter – Basic series inverter, parallel inverter - operation and waveforms - Three phase inverters (180, 120 degrees conduction modes of operation) - Voltage control techniques for inverters, Pulse width modulation techniques - Numerical problems.

TEXT BOOKS :

1. Power Electronics, Dr. P. S. Bimbhra, Khanna Publishers
2. Power Electronics Devices, Circuits and Industrial applications, V. R. Moorthi, Oxford University Press.

REFERENCE BOOKS :

1. Power Electronics; Circuits, Devices and Applications, M. H. Rashid, Prentice Hall of India.
2. Power Electronics, M. D. Singh & K. B. Kanchandhani, Tata Mc Graw - Hill Publishing Company.
3. Power Electronics, Vedam Subramanyam, New Age International (P) Limited, Publishers.
4. Elements of Power Electronics, Philip T. Krein, Oxford University Press.
5. Power Electronics, M. S. Jamil Asghar, PHI Private Limited.
6. Power Electronics, P. C. Sen, Tata Mc Graw-Hill Publishing.
7. Power Electronics, K. Hari Babu, Scitech Publications India Pvt. Ltd.
8. Principles of Power Electronics, John G. Kassakian, martin F. Schlect, Geroge C. Verghese, Pearson Education.
9. Thyristorised Power Controllers, G. K. Dubey, S. R. Doradra, A. joshi and R. M. K. Sinha, New Age International (P) Limited Publishers.

Outcome:

- Discuss the basics of power electronic devices.
- Knowledge on construction operation V-I characteristics commutation firing and protection of various power semiconductor devices.
- Discover of power electronic converters in power control applications.
- Construct the Chopper circuits.
- Compare characteristics of SCR, BJT, MOSFET and IGBT.
- Understand the role power electronics play in the improvement of energy usage efficiency
- Experiment the design of AC voltage controller and Cyclo Converter.

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B.Tech. - III Year – I Semester

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(R20EEE3102) Power System-II

Course Objective : To analyze the performance of transmission lines.

- To understand the voltage control and compensation methods.
- To understand the per unit representation of power systems.
- To examine the performance of travelling waves.
- To know the methods of overvoltage protection and Insulation coordination of transmission lines
- To know the symmetrical components and fault calculation analysis

UNIT - I:

Performance of Lines: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect, Power flow through a transmission line, receiving end power circle diagram.

UNIT - II:

Voltage Control: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers. Compensation In Power Systems: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

UNIT-III:

Per Unit Representation of Power Systems: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system. Travelling Waves on Transmission Lines: Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT - IV:

Overvoltage Protection and Insulation Coordination: Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

UNIT - V:

Symmetrical Components and Fault Calculations: Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. John J. Grainger & W.D. Stevenson: Power System Analysis – Mc Graw Hill International 1994.
2. C.L. Wadhwa: Electrical Power Systems – New Age International Pub. Co. Third Edition, 2001.

REFERENCE BOOKS:

1. Hadi Scadat: Power System Analysis – Tata Mc Graw Hill Pub. Co. 2002
2. W.D. Stevenson: Elements of Power system Analysis – McGraw Hill International Student Edition.
3. D.P. Kothari and I. J. Nagrath, Modern Power System Analysis - Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011

Course Outcome:

- Analyze transmission line performance.
- Apply load compensation techniques to control reactive power.
- Understand the application of per unit quantities.
- Design over voltage protection and insulation coordination.
- Determine the fault currents for symmetrical and unbalanced faults.

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B.Tech. - III Year – I Semester

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(R20EEE3103) Measurements and Instrumentation

Course objectives:

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.

Unit- I

Introduction to Measuring Instruments: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

Unit- II

Potentiometers & Instrument transformers: Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

Unit –III

Measurement of Power & Energy: Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

Unit – IV

DC & AC bridges: Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desauty's Bridge - Wien's bridge – Schering Bridge.

Unit-V

Transducers: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes. Measurement of Non-Electrical Quantities: Measurement of strain, Gauge sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

Text Books:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

Reference Books:

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. "R. K. Rajput", "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. "Buckingham and Price", "Electrical Measurements", Prentice – Hall, 1988.
4. "Reissland, M. U", "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1 st Edition 2010.
5. "E.W. Golding and F. C. Widdis", "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

Course Outcomes: After completion of this course, the student

- Understand different types of measuring instruments, their construction, operation and characteristics.
- Understand the Principle and operation Potentiometers & Instrument transformers.
- Identify the instruments suitable for typical measurements.
- Apply the suitable method for measurement of resistance, inductance and capacitance
- Understand the different types of bridges.
- Apply the knowledge about transducers and instrument transformers to use them effectively.

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Professional Elective-I
(R20CSE3164) Computer Architecture

OBJECTIVES:

- To make students understand the basic structure and operation of digital computer.
- To understand the hardware-software interface.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS

ALU – Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM

Instruction-level-parallelism – Parallel processing challenges – Flynn’s classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS

Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, TLBs – Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TEXT BOOK:

- David A. Patterson And John L. Hennessey, “Computer Organization And Design”, Fifth Edition, Morgan Kaufman / Elsevier, 2014.

REFERENCES:

- V. Carl Hamacher, Zvonko G. Varanasic And Safat G. Zaky, “Computer Organisation“, VI Edition, Mc Graw-Hill Inc, 2012.
- William Stallings “Computer Organization And Architecture”, Seventh Edition, Pearson Education, 2006.
- Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.

- Govindarajalu, “Computer Architecture And Organization, Design Principles And Applications”, First Edition, Tata Mc Graw Hill, New Delhi, 2005.
- John P. Hayes, “Computer Architecture And Organization”, Third Edition, Tata Mc Graw Hill, 1998.
- [Http://Nptel.Ac.In/](http://Nptel.Ac.In/).

OUTCOMES:

At The End Of The Course, The Student Should Be Able To:

- Design Arithmetic And Logic Unit.
- Design And Analyse Pipelined Control Units
- Understand Parallel Processing Architectures.
- Evaluate Performance Of Memory Systems.

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B.Tech. - III Year – I Semester

L T P C
3 0 0 3

Professional Elective-I
(R20EEE3111) High Voltage Engineering

Objectives

This subject deals with the detailed

- Analysis of Breakdown occurring in gaseous, liquids and solid dielectrics.
- Information about generation and measurement of High voltage and current.
- In addition High voltage testing methods are also discussed.

UNIT – I

Introduction to High Voltage Engineering: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT – II

Break Down in Dielectric Materials: Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law – Streamer Theory of Breakdown in Gases. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT – III

Generation & Measurement of High Voltages & Currents : Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators. Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents- direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT – IV

Over Voltages & Insulation Co-Ordination: Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

UNIT – V

Testing Of Materials & Electrical Apparatus: Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

TEXT BOOKS:

1. High Voltage Engineering, M.S.Naidu and V. Kamaraju, TMH Publications.
2. High Voltage Engineering, C.L.Wadhwa, New Age Internationals (P) Limited.

REFERENCE BOOKS:

1. High Voltage Engineering: Fundamentals, E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier.
2. High Voltage Insulation Engineering, Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited.
3. High Voltage Engineering, Theory and Practice, Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy, Roshdy Radwan , Marcel Dekker

Outcomes:

After going through this course the student gets a thorough

- Gains knowledge on basics of high voltage engineering.
- To identify the Break-down phenomenon in different types of dielectrics.
- To analyze the generation and measurement of high voltages and currents.
- To discuss the phenomenon of over-voltages system faults and other abnormal conditions
- Discuss the concept of insulation coordination.
- To understand testing of various materials and electrical apparatus used in high voltage engineering, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

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B.Tech. - III Year – I Semester

L T P C
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Professional Elective-I
(R20EEE3112) Electrical Machine Design

Objective:

- To develop knowledge on principles of design of static and rotating machines.
- To understand the design fundamental concepts, design main dimensions & cooling systems of transformers and main dimensions of rotating machine

Unit – I : Introduction

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines.

Unit – II : Transformers

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

Unit – III : Induction Motors

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

Unit – IV : Synchronous Machines

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Unit – V : Computer aided Design (CAD):

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.

Text / References:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.
3. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
4. K. L. Narang, "A Text Book of Electrical Engineering Drawings", SatyaPrakashan, 1969.
5. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
6. K. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
7. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the construction and performance characteristics of electrical machines.
- Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
- Understand the principles of electrical machine design and carry out a basic design of an ac machine.
- Use software tools to do design calculations.

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L	T	P	C
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(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.

Outcomes:

At the end of the course, the student will

- Understand the market dynamics namely, demand and supply, demand forecasting, elasticity of demand and supply, pricing methods and pricing in different market structures.
- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis.
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out.
- Understanding the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

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B.Tech. - III Year – I Semester

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(R20EEE31L1) Power System Simulation Lab

Course Objectives: Upon successful completion of the lab students will be familiar with:

- To perform voltage distributions across insulator strings
- To understand the high frequency transients
- To perform parameter estimation and fault analysis on Transmission lines
- To calculate Time constant calculations
- To perform Tariff Estimation
- To perform resonance circuit simulation

List of Experiments:

1. Generation of high frequency transients through RLC circuit.
2. Voltage distribution across insulator string.
3. Comparison of lumped and distributed transmission lines.
4. Calculation of fault currents of transmission line.
5. Time constant calculation of RL circuit.
6. Time constant calculation of RC circuit.
7. Time constant calculation of RLC circuit.
8. Simulation of Resonance circuit.
9. Calculation of R, L, C, Zs of 3-phase Transmission Line.
10. Estimation of TARIFF based on load curve.

NOTE: The above experiments shall be conducted using any software tool

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

- Perform various transmission line calculations.
- Understand Different circuits time constants.
- Analyze the experimental data and draw the conclusions.

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B.Tech. - III Year – I Semester

L	T	P	C
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(R20EEE31L2) Power Electronics Lab

Objectives : This course aims

- To understand the obtaining characteristics of power electronic devices.
- To understand the commutation techniques used in power electronics circuits and to test different power electronics converters.

Any Ten of the Experiments in Power Electronics Lab

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads.
5. Forced Commutation circuits (Class A, Class B, Class C, Class D and Class E).
6. DC Jones chopper with R and RL Loads.
7. Single Phase Parallel, inverter with R and RL loads.
8. Single Phase Cyclo-converter with R and RL loads.
9. Single Phase half controlled converter with R load.
10. Three Phase half controlled bridge converter with R-load.
11. Single Phase series inverter with R and RL loads.
12. Single Phase Bridge converter with R and RL loads.
13. Single Phase dual converter with RL loads.
14. Operation of MOSFET based chopper.

Outcomes:

- Use the techniques, skills and modern engineering tools necessary for engineering practice.
- To understand the characteristics of SCR, MOSFET & IGBT.
- Identify, formulate & solve engineering problems.
- Perform gate firing circuits.
- Analyze the Rectifier, Inverter and commutation of Choppers circuits
- Perform cyclo converter circuits on hardware kits.
- Demonstrate working of AC voltage controller circuit on hardware kit.

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B.Tech. - III Year – I Semester

L	T	P	C
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(R20EEE31L3) Measurements and Instrumentation Lab

Course Objectives:

- To calibrate LPF Watt Meter, energy meter, P. F Meter using electro dynamo meter type instrument as the standard instrument
- To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A. C Bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer.

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit
6. Schering bridge & Anderson bridge.
7. Measurement of 3-phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.

In addition to the above eight experiments, at-least any two of the experiments from the following list are required to be conducted:

9. Calibration LPF wattmeter – by Phantom testing
10. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given C.T. by Null method.
12. P.T. testing by comparison – V.G. as Null detector – Measurement of % ratio error and phase angle of the given P.T.
13. LVDT and capacitance pickup – characteristics and Calibration
14. Resistance strain gauge – strain measurements and Calibration
15. Transformer turns ratio measurement using a.c. bridge
16. Measurement of % ratio error and phase angle of given C.T. by comparison.

Course Outcomes: After completion of this lab the student is able to

- to choose instruments
- test any instrument
- find the accuracy of any instrument by performing experiment
- calibrate PMMC instrument using D.C potentiometer

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L	T	P	C
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(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.*

Outcomes

- ☞ Accomplishment of sound vocabulary and its proper use contextually.
- ☞ Flair in Writing and felicity in written expression.
- ☞ Enhanced job prospects.
- ☞ Effective Speaking Abilities

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B.Tech. - III Year – I Semester		L	T	P	C
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(R20MAC3100) MOOCs-I					

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B.Tech. - III Year – II Semester

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**Professional Elective-II
(R20ECE3202) Digital signal processing**

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. ElAli, CRC press, 2009.
5. *Digital Signal Processing - A Practical approach*, Emmanuel C. Ifeachor and Barrie W. Jervis, 2 Edition, Pearson Education, 2009.
6. Digital Signal Processing - Nagoor Khani, TMG, 2012

Outcomes:

On completion of this subject, the student should be able to:

- Perform time, frequency and Z -transform analysis on signals and systems.
- Understand the inter-relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of roundoff errors.
- Design a digital filter for a given specifications. □ Understand the fast computation of DFT and appreciate the FFT processing.
- Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

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Professional Elective-II
(R20EEE3221) **Power Semiconductor Drives**

Objective:

This course is an extension of Power Electronics applications to AC and DC drives.

This course focuses on:

- To acquire the knowledge on Control of DC motor drives with single phase and three phase converters and choppers are given in detail.
- The control of AC motor drives with variable frequency converters and variable voltage are presented.

UNIT - I:

Control of DC Motors through Phase Controlled Rectifiers: Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors — continuous current operation — output voltage and current waveforms — Speed and Torque expressions — Speed — Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters connected to DC separately excited and DC series motors — output voltage and current waveforms — Speed and Torque expressions — Speed — Torque characteristics — Problems.

UNIT - II:

Four Quadrant Operation of DC Drives through Dual Converters: Introduction to Four quadrant operation — Motoring operations, Electric Braking — Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of DC motors by dual converters — Closed loop operation of DC motor (Block Diagram Only).

UNIT-III:

Control of DC Motors By Choppers (1-, 2-, 4- Quadrant Operations): Single quadrant, Two — quadrant and four quadrant chopper fed dc separately excited and series excited motors — Continuous current operation — Output voltage and current wave forms — Speed torque expressions — speed torque characteristics — Problems on Chopper fed DC Motors — Closed Loop operation (Block Diagram Only).

UNIT - IV:

Control of Induction Motors: Variable voltage characteristics: Control of Induction Motor by Ac Voltage Controllers — Waveforms — speed torque characteristics.

Variable frequency characteristics: Variable frequency control of induction motor by Voltage source and current source inverter and cyclo-converters PWM control — Comparison of VSI and CSI operations — Speed torque characteristics — numerical problems on induction motor drives — Closed loop operation of induction motor drives (Block Diagram Only).

Static rotor resistance control: Slip power recovery — Static Scherbius drive — Static Kramer Drive — their performance and speed torque characteristics — advantages applications — problems.

UNIT - V:

Control of Synchronous Motors: Separate control & self control of synchronous motors — Operation of self controlled synchronous motors by VSI and CSI cycloconverters. Load commutated CSI fed Synchronous Motor — Operation — Waveforms — speed torque characteristics — Applications — Advantages and Numerical Problems — Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cyclo converter, PWM, VFI, CSI.

TEXT BOOKS:

1. Power Semiconductor Drives, PV Rao, BS Publications.
2. Fundamentals of Electric Drives, G K Dubey Narosa Publications

REFERENCE BOOKS:

1. Power Semiconductor Drives, S. B. Dewan, G. R. Slemon , A. Straughen, Wiley Pvt Ltd.
2. Electric Drives N. K. De, P. K. Sen, PHI Learning Private Ltd.
3. Thyristor Control of Electric drives, Vedam Subramanyam Tata McGraw Hill Publications.
4. Electrical machines and Drive Systems, John Hindmarsh, Alasdair Renfrew, Newnes.
5. Electric Motors and Drives, Fundamentals, Types and Applications Austin Hughes, Newnes.
6. Power Electronics and Variable Frequency Drives Technology and Applications, Bimal K. Bose, Wiley India Pvt. Ltd.
7. A First course on Electrical Drives, S K Pillai, New Age International (P) Ltd.
8. Modern Power Electronics and AC Drives, B.K.Bose, PHI.
9. Power Electronic Circuits, Devices and applications, M.H.Rashid, **PHI**.

Outcome:

- After going through this course the student gets a thorough knowledge on, steady-state analysis
- To understand the operation of control speed-torque characteristics and closed-loop operation of DC motors (separately excited shunt motor and series motor) through phase controlled rectifiers
- To analyze the operation and working of choppers
- To understand different types of quadratic operations such as single-quadrant two-quadrant and four- quadrant operations
- To understand the concept of braking reverse-motoring reverse
- To regenerative braking operations of DC motor's

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Professional Elective-II
(R20EEE3222) Wind and Solar Energy systems

Course Objectives:

At the end of this course, students will demonstrate the ability to

- Understanding the energy scenario and the consequent growth of the power generation from renewable energy sources.
- Understanding the basic physics of wind and solar power generation.
- Understanding the power electronic interfaces for wind and solar generation.
- Understanding the issues related to the grid-integration of solar and wind energy systems.

Unit - I: Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

Unit - II: Wind generator topologies: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

Unit - III: The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Unit - IV: Solar photovoltaic: Technologies- Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

Unit - V: Network Integration Issues: Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

Text / References:

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
3. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
4. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
6. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
- Understand the basic physics of wind and solar power generation.
- Understand the power electronic interfaces for wind and solar generation.
- Understand the issues related to the grid-integration of solar and wind energy systems.

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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.

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, Types 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 Z- Transform 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 Systems – 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:

- Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
- Express periodic signals in terms of Fourier series and express the spectrum and express the arbitrary signal (discrete) as Fourier transform to draw the spectrum.
- Understands the principle of linear system, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and power Density Spectrum.
- Can design a system for sampling a signal.
- For a given system, response can be obtained using Laplace transform, properties and ROC of L.T.
- Study the continuous and discrete signal relation and relation between F.T., L.T. & Z.T, properties, ROC of Z Transform.

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(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 :

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

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(R20EEE3201) Power System Protection

Objectives

This course deals with:-

- All varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards.
- It emphasis on Neutral grounding for overall protection..

UNIT – I

Circuit Breakers: Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures. Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – II

Electromagnetic and Static Relays: Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. **Relays Classification:** Instantaneous, DMT and IDMT types. Application of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation. **Distance relays:** Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. **Static Relays:** Static Relays verses Electromagnetic Relays.

UNIT – III

Generator & Transformer Protection : Protection of generators: against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected. **Protection of transformers:** Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

UNIT – IV

Feeder & Bus-Bar protection & Grounding: Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay. Protection of Bus bars – Differential protection. **Neutral Grounding:** Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

UNIT – V

Protection Against Over Voltages: Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinco-xide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. Switchgear and Protection, Sunil S Rao, Khanna Publlishers.
2. Protection and Switchgear, Bhavesh Bhalja, R. P. Mahesheari, Nilesh G. Chothani, Oxford University Press.

REFERENCE BOOKS:

1. Electrical Power Systems, C.L.Wadhwa, New Age international (P) Limited, Publishers.
2. Power System Protection and Switchgear, Badari Ram, D.N Viswakarma, TMH Publications.
3. Electrical Power System Protection, C. Christopoulos and A. Wright, Springer International.
4. Electrical Power Systems, PSR. Murty, BS Publications.
5. Power system protection and switch gear by Bhuvanesh Oza, TMH,
6. A Text Book on Power System Engineering, M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
7. A Textbook of Power System Engineering, R. K. Rajput, Laxmi Publications (P) Limited.
8. Principles of Power Systems, V.K Mehta and Rohit Mehta S.Chand Company Pvt. Ltd.

Outcomes:

- The student gets a thorough knowledge on, various types of protective devices (circuit breakers, relays etc..) and their co-ordination, protection of generators,
- To understand the concept of protection of transformers, by using Buchholtz relay Protection
- Able to get knowledge about protection of feeders, bus-bars, through different types of protective devices
- To analyze the concept of overvoltage protection and lightning
- To understand the concept of earthing and grounding, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

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(R20EEE3202) Power System Operation and Control

Course Objectives:

- To understand real power control and operation
- To know the importance of frequency control
- To analyze different methods to control reactive power
- To understand unit commitment problem and importance of economic load dispatch
- To understand real time control of power systems

UNIT - I

Load Flow Studies

Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods - Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled method-Merits and demerits of the above methods-System data for load flow study

UNIT - II

Economic Operation of Power Systems Distribution of load between units within a plant-Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT - III

Load Frequency Control Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speedgoverning system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled cases and controlled cases)

UNIT - IV

Power System Stability The stability problem-Steady state stability, transient stability and Dynamic stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability

UNIT - V

Computer Control of Power Systems Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – Importance of Load Forecasting and simple techniques of forecasting.

TEXT BOOKS

1. C. L. Wadhwa, Electrical Power Systems, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCE BOOKS:

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

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

- **Understand operation and control of power systems.**
- **Analyze various functions of Energy Management System (EMS) functions.**
- **Analyze whether the machine is in stable or unstable position.**
- **Understand power system deregulation and restructuring**

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(R20EEE32L1) Power System Lab

Course Objectives:

- Perform testing of CT, PT's and Insulator strings
- To find sequence impedances of 3- Φ synchronous machine and Transformer
- To perform fault analysis on Transmission line models and Generators.

The following experiments are required to be conducted as compulsory experiments:

Part - A

1. Characteristics of IDMT Over Current Relay.
2. Differential protection of 1- Φ transformer.
3. Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
4. Testing of CT, PT's and Insulator strings.
5. Finding the sequence impedances of 3- Φ synchronous machine.
6. Finding the sequence impedances of 3- Φ Transformer. In addition to the above six experiments, at least any four of the experiments from the following list are required to be conducted.

Part - B

1. LG, LL and 3- Φ fault analysis of 3- Φ synchronous machine.
2. Power circle diagrams of a 3- Φ transmission line model.
3. ABCD constants and Regulation of a 3- Φ transmission line model.
4. Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point method.
5. Formation of YBUS.
6. Load Flow Analysis using Gauss Seidal (GS) Method.
7. Load Flow Analysis using Fast Decoupled (FD) Method.
8. Formation of ZBUS.

Reference Books:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.
3. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.

Course Outcomes: After completion of this lab, the student will be able to

- Perform various load flow techniques
- Understand Different protection methods
- Analyze the experimental data and draw the conclusions.

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(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:

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

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(R20ECE32L4) Signals and Systems 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 realizability and stability properties.
9. Gibbs Phenomenon
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and ZPlane for the given transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S.Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling Theorem Verification.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

Outcomes:

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

- Interpret any signal in terms of complete sets of orthogonal functions and understands the principles of basic signals
- Sketch Fourier spectrum by using Fourier series and Fourier transforms.
- Apply sampling theorem to reconstruct signal from its samples.
- Design a distortion less LTI system and derive filter characteristics of a system.
- Determine convolution, correlation in time domain and frequency domain.
- Analyze Laplace Transforms, Fourier Transforms and Z-Transforms.

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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	0	0	3

Professional Elective-III
(R20EEE4131) Digital Control systems

Objectives

This course gives

- To understand the fundamentals digital control systems, z-transforms,
- Analysis of state space representation of the control systems,
- To understand the concepts of controllability and observability, estimation of stability in different domains, design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations.

UNIT – I

Introduction : Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

Z – TRANSFORMS: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms. Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

UNIT – II

State Space Analysis: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and its Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations. Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT – III

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – IV

Design of Discrete Time Control System : Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

UNIT – V

State Feedback Controllers & Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman’s formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS:

1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2 Edition.
2. Digital Control Systems , V. I. George, C. P. Kurian, Cengage Learning

REFERENCE BOOKS:

1. Digital Control Systems, Kuo, Oxford University Press, 2 Edition, 2003. Digital Control and State Variable Methods by M.Gopal, TMH .
2. Digital Control Engineering Analysis and Design M. Sami Fadali Antonio Visioli, AP Academic Press.

Outcomes:

After going through this course the student gets a thorough

- Knowledge on basics of digital control systems, z-transforms, mapping between S-plane and Z-plane.
- To analyze state-space analysis State transition matrix and its Properties.
- Concept of controllability and observability, derivation of pulse-transfer function.
- Stability analysis in S-domain and Z domains, stability through jury-stability test, stability through bilinear transformation and R-H criteria.
- Design of discrete-time control systems, design of lag, lead, lead-lag compensators, and design of PID controllers.
- Design of state feedback controllers and observers, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

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B.Tech. - IV Year – I Semester

L	T	P	C
3	0	0	3

Professional Elective-III
(R20EEE4132) **Optimization Techniques**

This course deals with

- Understanding the various optimization techniques i.e classical, linear programming, transportation problem,
- Understanding the simplex algorithm, dynamic programming, constrained and unconstrained optimization techniques.
- Analyzing the problems and optimizing an electrical and electronic engineering circuits design problems in real world situations.

UNIT – I

Introduction & Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – II

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT – III

Transportation Problem & Unconstrained Optimization: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel’s approximation method – testing for optimality of balanced transportation problems.

One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method. Univariate method, Powell’s method and steepest descent method.

UNIT – IV

Constrained Nonlinear Programming: Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:

1. Engineering optimization: Theory and practice”, S. S.Rao, New Age International (P) Limited.
2. Optimization Methods in Operations Research and systems Analysis, K.V. Mittal and C. Mohan, New Age International (P) Limited.

REFERENCE BOOKS:

1. Operations Research, Dr. S.D.Sharma.
2. Introductory Operations Research, H.S. Kasene & K.D. Kumar, Springer (India), Pvt .LTd.
3. Operations Research: An Introduction, H.A.Taha, Pearson Pvt. Ltd.
4. Operations Research, Richard Bronson, Govindasami Naadimuthu, Tata Mc Graw – Hill Company Limited.

Outcomes:

After going through this course the student gets a thorough

- Describe clearly a problem, identify its parts and analyze the individual functions
- Knowledge on Optimization of electrical and electronics engineering problems through classical optimization techniques.
- To understand the linear programming, simplex algorithm.
- Discuss the Transportation problem, unconstrained optimization.
- To analyze the constrained non-linear programming.
- Identify the Dynamic programming with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

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B.Tech. - IV Year – I Semester

L	T	P	C
3	0	0	3

**Professional Elective-III
(R20EEE4133) Electrical and Hybrid Vehicles**

Course Objectives:

At the end of this course, students will demonstrate the ability to

- Understanding the models to describe hybrid vehicles and their performance.
- Understanding the different possible ways of energy storage.
- Understanding the different strategies related to energy storage systems.

Unit – I : Introduction :

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Unit - II:Hybrid Electric Drive-trains:

Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Unit - III: Electric Trains

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drivetrain topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit – IV: Energy Storage

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

Unit - V: Energy Management Strategies

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text / References:

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.

3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
4. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand the different strategies related to energy storage systems.
- Understand working of different configurations of electric vehicles
- Understand hybrid vehicle configuration and its components, performance analysis
- Understand the properties of batteries and its types
- Understand of electric vehicle drive systems
- Understand of hybrid electric vehicles.

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B.Tech. - IV Year – I Semester

L T P C
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Professional Elective-IV
(R20EEE4141) HVDC Transmission

Objective :

This subject deals with

- Understanding the importance of HVDC transmission,
- Analysis of HVDC converters, Faults and protections, Harmonics and Filters.
- It also deals with Reactive power control and Power factor improvements of the system.

UNIT – I : BASIC CONCEPTS

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC & DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

ANALYSIS OF HVDC CONVERTERS

Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star – star mode – their performance.

UNIT – II CONVERTER & HVDC SYSTEM CONTROL

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

REACTIVE POWER CONTROL IN HVDC

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

UNIT –III POWER FLOW ANALYSIS IN AC/DC SYSTEMS

Modelling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC loadflow – P.U. System for d.c. quantities-solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT- IV CONVERTER FAULT & PROTECTION

Converter faults – protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers –Audible noise-space charge field-corona effects on DC lines- Radio interference.

UNIT – V HARMONICS

Generation of Harmonics –Characteristics harmonics,calculation of AC Harmonics,Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics

FILTERS

Types of AC filters,Design of Single tuned filters –Design of High pass filters.

TEXT BOOKS:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.

REFERENCE BOOKS:

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications.

Outcomes

- Understand the importance of Transmission power through HVDC.
- Analyse the HVDC Converter operation.
- Discuss firing angle control of 6 pulse,12 pulse circuits.
- Discuss harmonics in HVDC.
- Identify the importance of filters for HVDC system.
- Analyse the impact of AC system faults on DC system operation.
- Identify the need for proper grounding for HVDC operation.

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B.Tech. - IV Year – I Semester

L	T	P	C
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**Professional Elective-IV
(R20EEE4142) Power System Reliability**

Objectives

- To understand the language of power system reliability analysis.
- To develop analytical models for power system reliability analysis.
- Implement and use algorithms for power system reliability analysis

UNIT-I: Generating System Reliability Analysis – I

Generation system model – capacity outage probability tables – Recursive relation for capacitive model building – sequential addition method – unit removal – Evaluation of loss of load and energy indices – Examples.

UNIT-II: Generating System Reliability Analysis – II

Frequency and Duration methods – Evaluation of equivalent transitional rates of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of nonidentical generating units – 2- level daily load representation - merging generation and load models – Examples.

UNIT-III: Operating Reserve Evaluation

Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve units – Modelling using STPM approach.

Bulk Power System Reliability Evaluation: Basic configuration – conditional probability approach – system and load point reliability indices – weather effects on transmission lines – Weighted average rate and Markov model – Common mode failures.

UNIT-IV: Inter Connected System Reliability Analysis

Probability array method – Two inter connected systems with independent loads – effects of limited and unlimited tie capacity - imperfect tie – Two connected Systems with correlated loads – Expression for cumulative probability and cumulative frequency.

Distribution System Reliability Analysis – I (Radial configuration):

Basic Techniques – Radial networks –Evaluation of Basic reliability indices, performance indices – load point and system reliability indices – customer oriented, loss and energy oriented indices – Examples.

UNIT-V: Distribution System Reliability Analysis – II (Parallel Configuration)

Basic techniques – inclusion of bus bar failures, scheduled maintenance – temporary and transient failures – weather effects – common mode failures –Evaluation of various indices – Examples

Substations and Switching Stations:

Effects of short-circuits - breaker operation – Open and Short-circuit failures – Active and Passive failures – switching after faults – circuit breaker model – preventive maintenance – exponential maintenance times.

REFERENCE BOOKS:

1. Reliability Evaluation of Power Systems by Roy Billinton and Ronald N. Allan, Plenum press, New York and London (Second Edition), 1996.
2. Reliability Modeling in Electric Power Systems by J. Endrenyi, John Wiley and Sons

Outcomes:

- Understand the importance of maintaining reliability of power system components.
- Apply the probabilistic methods for evaluating the reliability of generation and transmission systems.
- Assess the different models of system components in reliability studies.
- Analysis and Distribution System Reliability Analysis – I (Radial configuration).
- Analyze the Distribution System Reliability Analysis – II (Parallel Configuration).
- Understand the Effects of short-circuits - breaker operation – Open and Short-circuit failures.

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L T P C
3 1 0 4

**Professional Elective-IV
(R20EEE4143) Industrial Electrical Systems**

Course Objectives:

- Understanding the skills and knowledge necessary to successfully carry out basic service and maintenance of Industrial Electrical Systems in a safe and environmentally sound manner.

Unit - I: Electrical System Components

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices

Unit - II: Residential and Commercial Electrical Systems

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

Unit - III: Illumination Systems

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

Unit - IV: Industrial Electrical Systems I

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

Unit - V: Industrial Electrical Systems II

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation : Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Text/Reference Books

1. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khanna publishers, 2008.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2007.
3. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
4. Web site for IS Standards.
5. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.
- Understand various components of industrial electrical systems.
- Analyze and select the proper size of various electrical system components.

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L	T	P	C
3	0	0	3

(R20MBA4101) Fundamentals of Management for Engineers

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills.

Course Outcome: The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT-I: Introduction to Management: Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT-II: Planning and Decision Making: General Framework for Planning – Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving – Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT-III: Organization and HRM: Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT-IV: Leading and Motivation: Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership. Motivation – Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories – Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT-V: Controlling: Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXT BOOKS:

- Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
- Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:

- Essentials of Management, Koontz Kleihrich, Tata Mc – Graw Hill.
- Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.

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B.Tech. - IV Year – I Semester

L	T	P	C
0	0	3	1.5

(R20EEE41L1) Electrical & Electronics Design Lab

Course Objectives:

- To illustrate the design, application, and limitations of electronic circuits by laboratory experience. To study the engineering design of a commercial electronic system.
1. Basic concepts on measurements;
 2. Noise in electronic systems;
 3. Sensors and signal conditioning circuits;
 4. Introduction to electronic instrumentation and PC based data acquisition;
 5. Electronic system design, Analog system design,
 6. Interfacing of analog and digital systems,
 7. Embedded systems, Electronic system design employing microcontrollers,
 8. CPLDs, and FPGAs, PCB design and layout;
 9. System assembly considerations.
 10. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of an application.

Text/Reference Books

1. A. S. Sedra and K. C. Smith, “Microelectronic circuits”, Oxford University Press, 2007.
2. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1997.
3. H.W.Ott, “Noise Reduction Techniques in Electronic Systems”, Wiley, 1989.
4. W.C. Bosshart, “Printed Circuit Boards: Design and Technology”, Tata McGraw Hill,1983.
5. G.L. Ginsberg, “Printed Circuit Design”, McGraw Hill, 1991.

Course Outcomes: At the end of the course, students will demonstrate the ability to

- Understand the practical issues related to practical implementation of applications using electronic circuits.
- Choose appropriate components, software and hardware platforms.
- Design a Printed Circuit Board, get it made and populate/solder it with components.
- Work as a team with other students to implement an application.

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B.Tech. - IV Year – I Semester		L	T	P	C
		0	0	3	1.5
(R20EEE41L2) Technical Seminar					

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY					
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B.Tech. - IV Year – I Semester		L	T	P	C
		0	0	6	3
(R20EEE41P2) Comprehensive Viva-voce					

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B.Tech. - IV Year – I Semester		L	T	P	C
		0	0	4	2
(R20EEE41P1) Industrial Oriented Mini Project/ Summer Internship					

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L	T	P	C
3	0	0	3

**Professional Elective-V
(R20EEE4251) Power Quality & FACTS**

Objectives:

- Understanding the operation principles of Power Quality terminology related Conditioning
- Understanding Power quality and to have an adequate knowledge in Radio interference techniques for Radio interference and supply

Unit - I: Transmission Lines and Series/Shunt Reactive Power Compensation

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

Thyristor-based Flexible AC Transmission Controllers (FACTS) : Description and Characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch. Configurations/Modes of Operation, Harmonics and control of SVC and TCSC. Fault Current Limiter.

Unit - II: Voltage Source Converter based (FACTS) controllers

Voltage Source Converters (VSC): Six Pulse VSC, Multi-pulse and Multi-level Converters, Pulse-Width Modulation for VSCs. Selective Harmonic Elimination, Sinusoidal PWM and Space Vector Modulation. STATCOM: Principle of Operation, Reactive Power Control: Type I and Type II controllers, Static Synchronous Series Compensator (SSSC) and Unified Power Flow Controller (UPFC): Principle of Operation and Control. Working principle of Interphase Power Flow Controller. Other Devices: GTO Controlled Series Compensator. Fault Current Limiter.

Unit - III: Application of FACTS (4 hours)

Application of FACTS devices for power-flow control and stability improvement. Simulation example of power swing damping in a single-machine infinite bus system using a TCSC. Simulation example of voltage regulation of transmission mid-point voltage using a STATCOM.

Unit - IV: Power Quality Problems in Distribution Systems (4 hours)

Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement. Tolerance of Equipment: CBEMA curve.

Unit - V: DSTATCOM (8 hours)

Reactive Power Compensation, Harmonics and Unbalance mitigation in Distribution Systems using DSTATCOM and Shunt Active Filters. Synchronous Reference Frame Extraction of Reference Currents. Current Control Techniques in for DSTATCOM.

Dynamic Voltage Restorer and Unified Power Quality Conditioner : Voltage Sag/Swell mitigation: Dynamic Voltage Restorer – Working Principle and Control Strategies. Series Active Filtering. Unified Power Quality Conditioner (UPQC): Working Principle. Capabilities and Control Strategies.

Text/References

1. N. G. Hingorani and L. Gyugyi, "Understanding FACTS: Concepts and Technology of FACTS Systems", Wiley-IEEE Press, 1999.
2. K. R. Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age International (P) Ltd. 2007.
3. T. J. E. Miller, "Reactive Power Control in Electric Systems", John Wiley and Sons, New York, 1983.
4. R. C. Dugan, "Electrical Power Systems Quality", McGraw Hill Education, 2012.
5. G. T. Heydt, "Electric Power Quality", Stars in a Circle Publications, 1991

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the characteristics of ac transmission and the effect of shunt and series reactive compensation.
- Understand the working principles of FACTS devices and their operating characteristics.
- Understand the basic concepts of power quality.
- Understand the working principles of devices to improve power quality.

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B.Tech. - IV Year – II Semester

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Professional Elective-V
(R20EEE4252) Control System Design

Objectives:

- To make students understand the concept of state –space analysis, to design the compensator in time and frequency domain, to design the PID compensator.

Unit – I: Design Specifications

Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.

Unit – II : Design of Classical Control System in the time domain

Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

Unit - III: Design of Classical Control System in frequency domain

Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.

Design of PID controllers

Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

Unit - IV: Control System Design in state space

Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Reduced order observer. Separation Principle.

Unit - V: Nonlinearities and its effect on system performance

Various types of non-linearities. Effect of various non-linearities on system performance. Singular points. Phase plot analysis.

Text and Reference Books :

1. N. Nise, "Control system Engineering", John Wiley, 2000.
2. I. J. Nagrath and M. Gopal, "Control system engineering", Wiley, 2000.
3. M. Gopal, "Digital Control Engineering", Wiley Eastern, 1988.
4. K. Ogata, "Modern Control Engineering", Prentice Hall, 2010.
5. B. C. Kuo, "Automatic Control system", Prentice Hall, 1995.
6. J. J. D'Azzo and C. H. Houpis, "Linear control system analysis and design (conventional and modern)", McGraw Hill, 1995.
7. R. T. Stefani and G. H. Hostetter, "Design of feedback Control Systems", Saunders College Pub, 1994.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand various design specifications.
- Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).
- Design controllers using the state-space approach.

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B.Tech. - IV Year – II Semester

L	T	P	C
3	0	0	3

Professional Elective-V
(R20CSE4265) AI Techniques in Electrical Engineering

Course Objectives:

- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithm, genetic operations and genetic mutations.

Unit-I: Artificial Neural Networks Introduction-Models of Neural Network - Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzman learning – Supervised learning – Unsupervised learning – Reinforcement learning - learning tasks.

Unit- II: ANN Paradigms Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

Unit – III: Fuzzy Logic Introduction – Fuzzy versus crisp – Fuzzy sets - Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers - Fuzzy Inference - Fuzzy Rule based system - Defuzzification methods.

Unit – IV: Genetic Algorithms Introduction-Encoding – Fitness Function-Reproduction operators - Genetic Modeling – Genetic operators - Crossover - Single-site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover - Crossover Rate - Inversion & Deletion – Mutation operator –Mutation – Mutation Rate-Bit-wise operators-Generational cycleconvergence of Genetic Algorithm.

Unit-V: Applications of AI Techniques Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability) Reactive power control – speed control of DC and AC Motors.

Text Books:

1. S.Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms”- PHI, New Delhi, 2003.

References:

1. P.D.Wasserman, Van Nostrand Reinhold, ”Neural Computing Theory & Practice”, New York, 1989.
2. Bart Kosko, “Neural Network & Fuzzy System”, Prentice Hall, 1992.
3. G.J.Klir and T.A.Folger, “Fuzzy sets, Uncertainty and Information”, PHI, Pvt.Ltd, 1994.
4. D.E.Goldberg, “Genetic Algorithms”, Addison Wesley 1999.

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

- Understand feed forward neural networks, feedback neural networks and learning techniques.
- Understand fuzziness involved in various systems and fuzzy set theory.
- Develop fuzzy logic control for applications in electrical engineering
- Develop genetic algorithms for applications in electrical engineering.

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**Professional Elective-VI
(R20EEE4261) Smart Grid Technologies**

Course Objectives:

- To group various aspects of the smart grid,
- To define smart grid design to meet the needs of a utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

Unit-I: Introduction Introduction to smart grid - Electricity network - Local energy networks- Electric transportation - Low carbon central generation - Attributes of the smart grid - Alternate views of a smart grid.

Smart Grid To Evolve A Perfect Power System: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation.

Unit-II: DC Distribution And Smart Grid AC Vs DC sources-Benefits of and drives of DC power delivery systems - Powering equipment and appliances with DC-Data centers and information technology loads - Future neighborhood-Potential future work and research.

Intelligrid Architecture for the Smart Grid: Introduction- Launching intelligent grid - intelligent grid today - Smart grid vision based on the intelligent grid architecture Barriers and enabling technologies.

Unit-III: Dynamic Energy Systems Concept Smart energy efficient end use devices-Smart distributed energy resources - Advanced whole building control systems- Integrated communications architecture - Energy management-Role of technology in demand response- Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

Unit-IV: Energy Port as Part of the Smart Grid: Concept of energy - Port, generic features of the energy port.

Policies and Programs to Encourage End – Use Energy Efficiency: Policies and programs in action - multinational - national-state-city and corporate levels.

Market Implementation: Framework-factors influencing customer acceptance and response - program planning - monitoring and evaluation.

Unit-V: Efficient Electric End-Use Technology Alternatives Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

Text Books:

1. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response”- CRC Press, 2009.
2. Jean Claude Sabonnadière, Nouredine Hadjsaïd, “Smart Grids”, Wiley-ISTE, IEEE Press, May 2012

References:

1. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong.Wu, Akihiko Yokoyama, Nick Jenkins, “Smart Grid: Technology and Applications”- Wiley, 2012.
2. James Momoh, “Smart Grid: Fundamentals of Design and Analysis” - Wiley, IEEE Press, 2012

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

- Analyze the structure of an electricity market in either regulated or deregulated market conditions.
- Know the advantages of DC distribution and developing technologies in distribution
- Discriminate the trade-offs between economics and reliability of an electric power system.
- Differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets.
- Analyze the developments of smart and intelligent domestic systems.

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**Professional Elective-VI
(R20EEE4262) Electrical Distribution Systems**

Objectives

This course gives

- The complete knowledge of electrical distribution systems, the design of feeders, substations.
- Understanding the conceptual knowledge on how to determine the performance of a distribution system through its important parameters.
- It specifies how to improve the voltage profiles and power factor of the system to better value using various voltage control and compensation techniques.

UNIT – I

Introduction & General Concepts: Introduction to distribution systems: Load modeling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor.

Classification of loads: Residential, commercial, Agricultural and Industrial loads and their characteristics.

UNIT – II

Distribution Feeders & Substations: Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system. **Substations:** Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations.

UNIT – III

Distribution System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

UNIT – IV

Protective Devices & Co-Ordination: Objectives of distribution system protection, types of common faults and procedure for fault calculations.

Protective Devices: Principle of operation of Fuses, Circuit Reclosures, and line sectionalizers, and circuit breakers. **Coordination of Protective Devices:** General coordination procedure.

UNIT – V

Voltage Control & P.F Improvement: Equipment for voltage control, effect of series capacitors, line drop Compensation, effect of AVB/AVR. Powerfactor control using different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and Switched), capacitor allocation - Economic justification –Procedure to determine the best capacitor location.

TEXT BOOKS:

1. Electrical Power Distribution Systems, V.Kamaraju , TMH.
2. Electrical Distribution Systems, Dr. S. Siva naga raju, Dr. K. Shankar. Danapathi Rai Publications.

REFERENCE BOOKS:

1. Electric Power Distribution System Engineering, Turan Gonen, CRC Press.
2. Electric Power Generation, Transmission and Distribution, SN. Singh, PHI Publishers.

Outcomes:

- Perform load modeling and analyse the characteristics of loads .
- Articulate the design concepts of primary and secondary systems.
- Understand substation bus schemes and know the difference between 4&6 feeder patterns.
- Apply Knowledge of SCADA concepts for functioning of substations.
- Understand the coordination procedure of various protective devices.
- Determine the optimum capacitor location and can understand the applications of capacitors in distribution systems .
- Understand the importance of voltage control and know the equipment used for it.

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**Professional Elective-VI
(R20EEE4263) Advanced Control of Electric Drives**

Objectives:

To impart knowledge about fundamentals of Electric drives and control, operational strategies of dc and ac motor drives as per different quadrant operations and to discuss

Unit I Characteristics of Electric Motors:

Characteristics of DC motors, 3-Phase induction motors and synchronous motors, Starting and braking of electric motors. Dynamics of Electric Drives, Mechanical system, Fundamental torque equations, components of load torques, Dynamic conditions of a drive system, Energy loss in transient operations, Steady State Stability, Load equalization.

Unit II DC Motor Drives:

Starting, Braking and Speed Control, Transient analysis of separately excited motor with armature and field control, Energy losses during transient operation, Phase controlled converter fed DC drives, Dual-converter control of DC drive, Supply harmonics, Power factor and ripple in motor current, Chopper Control DC drives, Source current harmonic in Choppers.

Unit III Induction Motor Drives:

Starting, Braking and transient analysis, Calculation of energy losses, Speed control, Stator voltage control, Variable frequency control from voltage and current sources, Slip power recovery-Static Scherbius and Cramer drives.

Unit IV Synchronous Motor Drives:

Starting, Pull in and braking of synchronous motors, Speed control – variable frequency control, cycloconverters control, Brushless DC Motor, Linear Induction Motor, Stepper Motor and Switched Reduction Motor Drives, Important features and applications.

Unit V Energy Conservation in Electrical Drives:

Losses in electrical drive system, Measures for energy conservation in electric drives, Use of efficient motor, Energy efficient operation of drives, Improvement of power factor and quality of supply.

Reference Books:

1. G. K. Dubey : Fundamentals of Electrical Drives, 2nd Edition, Alpha Science International, 2001.
2. S. B. Dewan, Gordon R. Slemon and A. Straughen: Power Semiconductor Drives, John Wiley Pub.1996.
3. R. Krishnan: Electric Motor drives - Modelling, Analysis and Control, PHI India Ltd., 2002.
4. W. Shepherd, D. T. W. Liang and L.N. Hulley: Power Electronics and Motor Control, 2nd Edition, Cambridge Univ. Press, 1995.

Course Outcome: On the completion of the course, the student will be able

- To acquire the knowledge of selection of drives as per practical operational industrial requirement.
- To apply their knowledge to prepare control schemes as per different types of motors used in industries.
- To estimate & solve harmonic and power factor related problems in controlling AC and DC drives.

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(R20EEE42P1) Project Work					

LIST OF OPEN ELECTIVES**Open Elective – I**

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV3271	Disaster Management & Mitigation	3	0	0	3
2	R20CSE3272	Database Concepts				
3	R20ECE3273	Consumer Electronics				
4	R20EEE3274	Electrical Estimation & Costing				
5	R20INF3275	Information Technology Essentials				
6	R20MED3276	Introduction to Robotics				
7	R20HMS3277	Fundamentals of Entrepreneurship				
8	R20HMS3278	Day to Day Biology				

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OPEN ELECTIVE- I

L	T	P	C
3	0	0	3

(R20CIV3271) Disaster Management & Mitigation

The objective of this course is to provide an understanding of basic concepts of various disasters and its management. In addition, the course is expected to develop scientific temperament and mitigation techniques to manage disaster.

1. To understand basic concepts of disaster and hazards of India.
2. To study the various natural disasters.
3. To study the various manmade disasters.
4. To understand the disaster management principles.
5. To study the modern techniques used in disaster mitigation and management.

UNIT I - Introduction To Disaster - Meaning, Nature, Importance of Hazard, Risk, Vulnerability and Disaster Dimensions & Scope of Disaster Management - India's Key Hazards – Vulnerabilities - National disaster management framework - Disaster Management Cycle.

UNIT II - Natural Disaster - Natural Disasters- Meaning and nature of natural disaster; their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

UNIT III - Anthropogenic Disaster - Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation and industrial waste water pollution.

UNIT IV - Approaches in Disaster Management - Pre- disaster stage (preparedness) - Preparing hazard zonation maps, Predictability/ forecasting & warning - Preparing disaster preparedness plan Land use zoning - Preparedness through Information, education. Emergency Stage - Rescue training for search & operation - Immediate relief - Assessment surveys. Post Disaster stage – Rehabilitation - Social Aspect - Economic Aspect and Environmental Aspect.

UNIT V - Disaster Mitigation - Meteorological observatory - Seismological observatory - Hydrology Laboratory and Industrial Safety inspectorate. Technology in Disaster Management Emergency Management Systems (EMS) in the Disaster Management Cycle Remote Sensing and Geographic Information Systems(GIS) in Disaster Management.

TEXT BOOK

1. Sharma.S.R, “Disaster management”, A P H Publishers, 2011.

REFERENCES

6. VenuGopalRao.K, “Geoinformatics for Disaster Management”, Manglam Publishers and Distributors, 2010.
7. Singh.R.B, “Natural Hazards and Disaster Management: Vulnerability and Mitigation”, Rawat Publications, 2006.
8. Gupta.H.K, “Disaster Management”, University Press, India, 2003.
9. Gupta.M.C, “Manuals on Natural Disaster management in India”, National Centre for Disaster Management,IIPA, New Delhi, 2001.

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B.Tech. - III Year – II Semester

OPEN ELECTIVE- I

L	T	P	C
3	0	0	3

(R20CSE3272) Database Concepts

To study the concepts of Relational Database design and query languages

1. To provide a general introduction to relational model
2. To learn about ER diagrams
3. To learn about Query processing and Transaction Processing

UNIT I: Introduction to Database Management - Introduction to Database Management systems – History - Characteristics – Users- three-level architecture- Entity-- relationship data model.

UNIT II: The Relational Data Model and Relational Algebra - Data structures – Mapping E-R Model to Relational model – data manipulation – integrity – advantages – rules for fully relational systems – relational algebra – relational algebra queries.

UNIT III: Structured Query Language and Normalization - SQL – Data definition – manipulation – views SQL in procedural programming – data integrity and constraints – triggers – data control – database security. Normalization – Undesirable properties – single-valued normalization – desirable properties of decompositions – multivalued dependencies

UNIT IV: Storage Indexing and Transactions Management - Different types of memories – secondary storage – buffer management – file structures – heap files – sorted files – index and types – indexed sequential file – B-tree – B+ tree. Transaction management – concepts – examples – schedules – serializability – concurrency control – deadlocks – lock and multiple granularity – nonlocking techniques.

UNIT V: Database Backup, Recovery and Security - Database system failure – backup – recovery and concept of log – log-based recovery techniques – types of recovery – log-based immediate update recovery technique. Database Security – violations – identifications and authentication – authorization / access control – security of statistical databases – audit policy – internet applications and encryption.

TEXT BOOK

1. Gupta.G.K, “Database Management Systems”, Tata McGraw Hill, 2011.

REFERENCES

1. Silberschatz, Korth.H and Sudarshan.S, “Database System Concepts”, 6th Edition, McGraw-HillInternational, 2011.
2. Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom, “Database System The Complete Book, 1st Edition, Pearson 2002.
3. RamezElmasri and ShamkantB.Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson, 2008.

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OPEN ELECTIVE- I

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(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- Moore 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)

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OPEN ELECTIVE- I

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(R20EEE3274) Electrical Estimation & Costing

Unit I: Electrical Symbols and Diagrams: (i) Need of symbols; List of symbols for electrical equipment and accessories used in electrical works. Light, fan and power circuits, alarm and indicating circuit, contactor control circuits as per I.S.S. (ii) Type of diagrams - Wiring diagrams (multiple and single line representation) and schematic diagrams as per I.S.S. (* One Drawing Sheet for at least - 50 symbols).

Wiring materials and accessories: (1) Brief description, general specifications (as per I.S.S.) and approximate cost of different types of wires, cables, switches, distribution board, switch board, boxes, batten and its accessories, conduit and its accessories, lamp holders, socket outlets, plug ceiling roses. Fuse and energy meter used in domestic and power wiring installations.

Unit II: Light and Fan Circuits: Schematic and wiring diagrams (multiline and single line both) using junction boxes and looping systems for the following types of circuits:- (i) Light and fan controlled by necessary switches and regulators. (ii) Stair case wiring (iii) Corridor lighting (iv) One lamp controlled by three or more switches.

Unit III: Principles of Estimating and Costing: Purpose of estimating and costing, essentials of estimating and costing-market survey, price list and net prices, preparation of list of materials, calculation of material and labor cost, contingencies, overhead charges, profit and total cost. Estimation of Domestic Internal Wiring Circuits: (i) Description of various wiring systems and methods. (ii) Need of earthing and point to be earthed in internal wiring system as per IE rules. (iii) I.S. specifications, calculation of No. of points (light, fan, socket outlet), calculation of total load including domestic power, determination of no. of circuits, size of wires and cables, switches and main switch, distribution board and switch board, batten conduit and other wiring accessories.

Unit IV: Estimation of Power Wiring: I.S. specifications and I.E. rules, calculation of current for single and three phase motors. Determination of sizes of cables, conductors distribution board, main switches and starters for power circuits. Cost of equipment and accessories and schedule of materials. Estimation and cost of material and work for motors up to 20 H.P., pump sets and small workshops.

Unit V: Estimation of Overhead and Underground Distribution Lines: Main components of overhead lines-line supports, cross-arm, clamps, conductors and stay sets, lightning arrestors, danger plates, ant climbing devices, bird guards, jumpers etc., concreting of poles, earthing of transmission line, formation of lines, specification of materials for O.H. lines, I.S. specification and I.E. rules. Cost of material and work for overhead and underground lines upto 11 KV only.

Estimation of Small Sub-Station: Main equipment and auxiliaries installed on the substation. Estimation of materials required for a small distribution substation (indoor and outdoor type platform and pole mounted). Costing of material and work of above substations.

Text Books:

1. S.K Bhattacharya, "Electrical Engineering Drawing & Design Estimating".Wiley Eastern Ltd. New Delhi.
2. Surjeet Singh, "Electrical Design & Drawing" S.K.Kataria & Sons New Delhi.

Reference Books:

1. O. P. Soni, "Electrical Engg. Design & Drawing" SatyaPrakashan Delhi.

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OPEN ELECTIVE- I

L	T	P	C
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(R20INF3275) Information Technology Essentials

COURSE OBJECTIVES:

- To introduce the principles required for building web applications.
- To provide working knowledge of the technologies needed for web application development
- To know about scripting languages.
- To understand principles of database access and storage.
- To understand various applications related to Information Technology.

COURSE OUTCOMES: Student will be able to

- Design and deploy web-sites
- Design and deploy simple web-applications
- Create simple database applications
- Develop an information system
- Describe the basics of networking

UNIT I: Web Essentials - Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server – HTML basics – HTML tags and their use

UNIT II: Scripting Essentials - Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and HTML - Cookies – Sessions - Authentication – Introduction to JavaScript

UNIT III: Database Essentials - Database management - Database terms - MySQL - commands – Data types – Indexes – Functions – Accessing MySQL using PHP.

UNIT IV: Networking Essentials - Fundamental computer network concepts - Types of computer networks - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components

UNIT V: Application Essentials - Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson, 2012.

REFERENCES:

1. GottapuSasibhushanaRao, "Mobile Cellular Communication", Pearson, 2012.
2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, Introduction to Information Systems, Fifth Edition, Wiley Publication, 2014.
3. it-ebooks.org

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OPEN ELECTIVE- I

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(R20MED3276) Introduction to Robotics

COURSE OBJECTIVE: To impart knowledge about the basics of robot components and applications.

COURSE OUTCOMES:

1. Basics of Robot anatomy
2. Working of end effectors and drive systems
3. Kinematics and transformation analysis of robot
4. Various types of robot sensors
5. Robot cell design and applications of robot

UNIT I: Robot Basics - Robot-Basic concepts, Need, Law, History, Anatomy, specification. Robot configurations-Cartesian, cylinder, polar and articulate. Robot wrist mechanism, Precision and accuracy of robot-simple problems.

UNIT II: Robot Elements - End effectors-Classification, Types of Mechanical actuation, Gripper force analysis, Gripper design, Robot drive system-Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation.

UNIT III: Robot Kinematics - Robot kinematics – Direct and inverse kinematics – 2 and 3 DOF of kinematics analysis-Robot trajectories – Control of robot manipulators – Point to point, Contouring motion- 2D and 3D Transformation-Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation-Simple problems.

UNIT IV: Robot Sensors - Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors

UNIT V: Robot Cell Design And Applications - Robot work cell design and control – Safety measures in Robot – Robot cell layouts – Multiple robots and machine interference – Robot cycle time analysis – Industrial applications of robots, Nanorobots, Robot programming-Basic program.

TEXT BOOKS:

1. Deb.S.R, “Robotics Technology and Flexible Automation”, Tata McGraw – Hill Publishing Company Limited, 2010.
2. Mikell. P. Groover, ‘Industrial Robotics Technology’, Programming and Applications, McGraw Hill Co, 2008.

REFERENCES:

1. Klafter.R.D, Chmielewski.T.A, and Noggin’s., “Robot Engineering : An Integrated Approach”, Prentice Hall of India Pvt. Ltd.,1994.
2. Fu.K.S, Gonzalez.R.C&Lee.C.S.G, “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 1987
3. Craig.J.J, “Introduction to Robotics mechanics and control”, AddisonWesley, 1999.
4. Ray Asfahl.C, “Robots and Manufacturing Automation”, John Wiley & Sons Inc., 1985.
5. Kozyrey, Yu. “Industrial Robotics”, MIR Publishers Moscow, 1985.

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OPEN ELECTIVE- I

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(R20HMS3277) Fundamentals of Entrepreneurship

COURSE OBJECTIVES: To create awareness on entrepreneurship among engineering students and stimulating self-motivation to start up enterprise

COURSE OUTCOMES:

1. To provide awareness about entrepreneurship
2. To develop idea generation, creative and innovative skills
3. To self-motivate the students by making aware of different opportunities and successful growth stories
4. To learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.
5. To understand entrepreneurial process by way of studying different case studies and find exceptions to the process model of entrepreneurship.
6. To run a small enterprise with small capital for a short period and experience the science and art of doing business.

UNIT I: Introduction to Entrepreneurship - Understanding the Meaning of Entrepreneur; Characteristics and Qualities of an Entrepreneur; Entrepreneurs Vs Intrapreneurs and Managers; Classification of Entrepreneurs; Factors Influencing Entrepreneurship; Entrepreneurial Environment; Entrepreneurial Growth; Problems and Challenges of Entrepreneurs; Entrepreneurial Scenario in India.

UNIT II: Micro, Small and Medium Enterprises (MSMEs) - MSMEs – Definition and Significance in Indian Economy; MSME Schemes, Challenges and Difficulties in availing MSME Schemes, Forms of Business; Women Entrepreneurship; Rural Entrepreneurship; Family Business and First Generation Entrepreneurs.

UNIT III: Idea Generation and Feasibility Analysis - Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.

UNIT IV: Business Model and Plan in Respective Industry - Business model – Meaning, designing, analyzing and improvising; Business Plan – Meaning, Scope and Need; Financial, Marketing, Human Resource and Production/Service Plan; Business plan Formats; Project report preparation and presentation; Why some Business Plan fails?

UNIT V: Financing and How to Start up Business? - Financial opportunity identification; Banking sources; Non-banking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business; Pre launch, Launch and Post launch requirements; Procedure for getting License and Registration; Challenges and Difficulties in Starting an Enterprise.

TEXT BOOKS :

1. Jayshree Suresh, “Entrepreneurial Development”, Margham Publishers, Chennai, 2011.
2. Poornima M Charantimath, “Entrepreneurship development small business enterprises”, Pearson, 2013.

REFERENCES:

1. Raj Shankar, “Entrepreneurship: Theory And Practice”, Vijay Nicole imprints ltd in

- collaboration with Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012
2. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, "Entrepreneurship", 8th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012
 3. Martin Roger, "The Design of Business", Harvard Business Publishing, 2009
 4. Roy Rajiv, "Entrepreneurship", Oxford University Press, 2011
 5. Drucker.F, Peter, "Innovation and Entrepreneurship", Harper business, 2006.

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B.Tech. - III Year – II Semester

OPEN ELECTIVE - I

L	T	P	C
3	0	0	3

(R20HMS3278) Day to Day Biology

COURSE OBJECTIVE: The purpose of this study is to know and understand the involvement of biology in day-to-day life. This would give insight into his or her own biological system, the diseases and disorders, antibiotics, and importance of environment in human life. This also provides application of biology in day to day life.

COURSE OBJECTIVES:

1. The student can understand the biology of human system and health.
2. This provides student with a scope for selection of healthy food and sustain environment.

UNIT I: Biology of Human Diseases and Disorders - Diabetes mellitus, communicable diseases, genetic disorders, vector borne diseases, antibiotics - mode of action.

UNIT II: Biology for Human - Blood pressure, immune system and immunity, cardiac infarction, in vitro fertilization, cord blood bank, stem cells.

UNIT III: Biology of Cosmetics and Detergents - Biology of complexion and texture, bioactive natural products in industrial use, bio surfactants, antioxidants.

UNIT IV: Biology and Nutrition - Dietary index, carbohydrates, proteins and fats, HDL and LDL, dairy products and application, herbal plants and home remedies.

UNIT V: Biology and Environment - Water pollution, air pollution, bioremediation, species biodiversity, global warming and greenhouse effect.

TEXT BOOKS:

1. Gareth J. Price, Biology: An Illustrated Guide to Science, Diagram Group, Infobase Publishing, 2006.
2. Pam Dodman, Real-Life Science Biology, Walch Publishing, 2008.

REFERENCES:

1. Biology: The Science of Life, Stephen Nowicki, <http://www.thegreatcourses.com/tgc/courses>.
2. Neil Schlager, Science of everyday things: Real-Life Biology, Gale Publishing 2002.

Open Elective –II

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV4181	Green Building Engineering	3	0	0	3
2	R20CSE4182	Cyber Security Fundamentals				
3	R20ECE4183	Principles of Modern Communication Systems				
4	R20EEE4184	Illumination Engineering				
5	R20INF4185	E-Commerce				
6	R20MED4186	Industrial Design & Ergonomics				
7	R20HMS4187	Creative Writing				
8	R20HMS4188	Design Thinking				
9		MOOCs – III				

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20CIV4181) Green Building Engineering

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

1. Describe the concepts of Green building
2. Adopt Renewable energy for buildings.
3. Implement Automation techniques in buildings.
4. Describe Actuator techniques for Automation
5. Choose appropriate materials for Green buildings

UNIT 1 Concept of Green Buildings : Green building initiatives, its origin, characteristics of a green building, green buildings in India, certification of green buildings.Criteria for rating – sustainability. Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; green cement, biodegradable materials, smart materials, engineering evaluation of these materials. Case study.

UNIT 2 Sources of Energy Renewable and non-renewable sources of energy ; coal, petroleum, nuclear, wind, solar, hydro, geothermal sources; potential of these sources, hazards, pollution; global scenario with reference to demand and supply in India. Energy arises. Carbon Emission: Forecasting, control of carbon emission, air quality and its monitoring carbon foot print; environmental issues, minimizing carbon emission.

UNIT 3 - Intelligent Buildings Intelligent buildings-Building automation-Smart buildings- Building services in high rise buildings-Green buildings-Energy efficient buildings for various zones-Case studies of residence, office buildings and other buildings in each zones. Case Study.

UNIT 4 Actuator Techniques Actuator and actuator materials – Piezoelectric and Electrostrictive Material – Magneto structure Material – Shape Memory Alloys – Electrorheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

UNIT 5 Materials For "Green" Systems Green materials, including biomaterials, biopolymers, bioplastics, and composites Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Paints, Roofs, Walls, and Cooling.Multifunctional Gas Sensors, Biomimetic Sensors, Optical Interference Sensors Thermo-, light-, and stimulus-responsive smart materials.

TEXT BOOKS

1. Sustainable Construction , Charles J. Kibert.,Third Edition
2. Green Building A to Z, Jerry Yudelson.

REFERENCE BOOKS

1 Advanced Technology for Smart buildings,James Sinopoli

E BOOKS <https://www.springer.com/in/book/9789811010002>

<https://www.elsevier.com/books/smart-buildings/casini/978-0-08-100635-1>

MOOC<https://www.mooc-list.com/tags/green-building>

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20CSE4182) Cyber Security Fundamentals

Course Objectives:

1. Understand the need for Cyber security and its related threats and attacks
2. Learn methods to become secure in the cyber world and securely communicate in the cyber world
3. Become knowledgeable about the best practices related to cyber security, regulations and laws associated with the same.

Course Outcomes:

The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context

UNIT I: Need for Cyber Security - Introduction to security- CIA triad-Case studies- security attacks-issues related to social networking - Guidelines

UNIT II: Methods to Secure yourself in the Cyber World - Why and What of Reversible and Irreversible Cryptographic mechanisms? Applications of Digital Signature - Good password practices

UNIT III: E-Commerce: Secure Transactions - What is E-commerce? – Online banking security- Online shopping fraud Guidelines and Recommendations

UNIT IV: EVERYDAY SECURITY - Connecting your laptop, mobile devices, PDAs to Internet- Managing your browser-Facebook Security-E-mail security – Safe guarding from Viruses: Antiviruses– Best practices and guidelines

UNIT V: CYBER SECURITY LAWS AND COMPETENT AUTHORITIES - Indian IT Act, 2008 - What is Cyber Forensics? – Functions of cybercrime cell – Responding to a cyber-attack

REFERENCES:

1. “Information Security Awareness Handbook, ISEA, Department of Electronics and Information Technology”, Government of India, 2010
2. deity.gov.in/sites/upload_files/dit/.../itact2000/it_amendment_act2008.pdf
3. www.schneier.com/blog/archives/2013/03/browser_securit.html
4. www.dhses.ny.gov/ocs/awareness-training-events/news/2010-03.cfm
5. <https://www.watsonhall.com/e-commerce-security/>

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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).

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20EEE4184) Illumination Engineering

COURSE OBJECTIVES:

- To provide an introduction to the fundamentals of illumination engineering and architectural lighting design.
- To impart lighting fundamentals, measurement, and technology and their application in the analysis and design of architectural lighting systems

COURSE OUTCOME: The students will be able to:

- i. Identify the criteria for the selection of lamps and lighting systems for an indoor or outdoor space
- ii. Perform calculations on photometric performance of light sources and luminaires for lighting design
- iii. Evaluate different types of lighting designs and applications

UNIT I: Introduction of Light : Types of illumination, Day lighting, Supplementary artificial lighting and total lighting, Quality of good lighting, Factors affecting the lighting-shadow, glare, reflection, Color rendering and stroboscopic effect, Methods of artificial lighting, Lighting systems-direct, indirect, semi direct, semi indirect, Lighting scheme, General and localized.

UNIT II: Measurement of Light: Definition of luminous flux, Luminous intensity, Lumen, Candle power, Illumination, M.H.C.P, M.S.C.P, M.H.S.C.P, Lamp efficiency, Brightness or luminance, Laws of illumination, Inverse square law and Lambert's Cosine law, Illumination at horizontal and vertical plane from point source, Concept of polar curve, Calculation of luminance and illumination in case of linear source, round source and flat source.

UNIT III: Design of Interior Lighting : Definitions of maintenance factor, Uniformity ratio, Direct ratio, Coefficients of utilization and factors affecting it, Illumination required for various work planes, Space to mounting height ratio, Types of fixtures and relative terms used for interior illumination such as DLOR and ULOR, Selection of lamp and luminance, Selection of utilization factor, reflection factor and maintenance factor Determination of Lamp Lumen output taking into account voltage and temperature variations, Calculation of wattage of each lamp and no of lamps needed, Layout of lamp luminaire, Calculation of space to mounting height ratio, Indian standard recommendation and standard practices for illumination levels in various areas, Special feature for entrance, staircase, Corridor lighting and industrial building.

UNIT IV: Design of Outdoor Lighting: Street Lighting : Types of street and their level of illumination required, Terms related to street and street lighting, Types of fixtures used and their suitable application, Various arrangements in street lighting, Requirements of good street lighting, Selection of lamp and luminaire, Calculation of their wattage, Number and arrangement, Calculation of space to mounting height ratio, Calculation of illumination level available on road.

UNIT V:Design of Outdoor Lighting: Flood Lighting: Terms related to flood lighting, Types of fixtures and their suitable applications, Selection of lamp and projector, Calculation of their wattage and number and their arrangement, Calculation of space to mounting height ratio, recommended method for aiming of lamp.

Special Features of Aesthetic Lighting: Monument and statue lighting, Sports lighting, Hospital lighting, Auditorium lighting.

Text Books:

1. D.C. Pritchard Lighting, Routledge, 2016
2. Jack L. Lindsey, Applied Illumination Engineering, PHI, 1991
3. John Matthews Introduction to the Design and Analysis of Building Electrical Systems, Springer, 1993
4. M.A. Cayless, Lamps and Lighting, Routledge, 1996

References:

1. IS CODE 3646
2. IS CODE 6665

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20INF4185) E – COMMERCE

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

1. Understand the E – commerce strategies and value chains
2. Understand the E-commerce services
3. Understand E - commerce infrastructure, its applications and Supply Chain Management.
4. Know the availability of latest technology and applications of E-Payment Mechanism.
5. Apply E-Commerce in business-to-business application.

UNIT 1: Electronic Commerce: Overview, Definition, Advantages & Disadvantages of E-Commerce, Threats of E-Commerce, Managerial Prospective, Rules & Regulation for Controlling Commerce, Relationship Between E-Commerce & Networking, Different Types of Networking for E-Commerce, internet, Intranet, EDI Systems, Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce Model, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement for E-Commerce, Business Model of E-Commerce; Model Based on Transaction Type, Model Based on Transaction Party- B2B, B2C, C2B, C2C, E-Governance.

UNIT 2: E-Strategy: Overview, Strategic Methods for developing E-Commerce. Four C's (Convergence, Collaborative, Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence - Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing: Collaborative Product Development, contract as per CAD, Simulations Collaboration, Security. Content Management: Definition of Content, Authoring Tools and Content Management, Content Management, Content - partnership, repositories, convergence, providers, Web Traffic.

UNIT 3: Traffic Management: Content Marketing Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weakness of Call Center, Customer Premises Equipment (CPE).

Supply Chain Management: E-logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution(SCE), SCEFramework, Internet's Effect on Supply Chain Power.

UNIT 4: E-Payment Mechanism: Payment through card system, E-Cheque, E-Cash, E-Payment, Threats& Protections.

E-Marketing: Home - Shopping, E-Marketing, Tele- Marketing

UNIT 5: Electronic Data Interchange (EDI): Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI, FACT/ GTDI), ANSIX-12, Data Encryption (DES/RSA)

Risks of E-Commerce: Overview, Security for E-Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital Certificates, Digital Signatures.

Text Book:

1. Electronic Commerce - Technologies & Applications, Bhaskar Bharat, TMH

Reference Books:

1. E-commerce, MM Oka, EPH
2. Frontiers of Electronics Commerce, Kalakotia, Whinston, Pearson Education
3. Electronic Commerce, Loshinpete, Murphy P. A., Jaico Publishing Housing
4. E-Commerce, Murthy, Himalaya Publishing.

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20MED4186) Industrial Design & Ergonomics

UNIT 1: Introduction: An approach to industrial design -elements of design structure for industrial design in engineering application in modern manufacturing systems. Ergonomics and Industrial Design: Introduction -general approach to the man- machine relationship- workstation design-working position.

UNIT 2: Control and Displays: Shapes and sizes of various controls and displays-multiple, displays and control situations - design of major controls in automobiles, machine tools etc Ergonomics and Production: ergonomics and product design -ergonomics in automated systems- expert systems for ergonomic design. Anthropometric data and its applications in ergonomic, design- limitations of anthropometric data- use of computerized database.

UNIT 3: Visual Effects of Line and Form: The mechanics of seeing- psychology of seeing general influences of line and form. Color: Color and light -color and objects- color and the eye -color consistency- color terms- reactions to color and color continuation -color on engineering equipment.

UNIT 4: Aesthetic Concepts: Concept of unity- concept of order with variety -concept of purpose style and environment- Aesthetic expressions. Style-components of style- house style, observation style in capital goods, case study.

UNIT 5: Industrial Design in Practice: General Design -specifying design equipment- rating the importance of industrial design -industrial design in the design process.

REFERENCE BOOKS:

1. Industrial Design for Engineers - Mayall W.H. - London Hiffie books Ltd.-1988.
2. Applied Ergonomics Hand Book - Brain Shakel (Edited) - Butterworth scientific. London
3. Introduction to Ergonomics - R. C. Bridger - McGraw Hill Publications -1995.
4. Human Factor Engineering - Sanders & McCormick - McGraw Hill Publications – 6th edition,2002.

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20HMS4187) Creative Writing

COURSE OBJECTIVE: This course introduces students to the practice of creative writing in the genres of poetry and fiction. In addition to honing their skills as creative writers, students will develop a critical vocabulary that will aid them in discussing poems and fiction produced by their peers. This course allows for experimentation with writing poetry, short fiction, and creative nonfiction in a writing workshop setting. Far from undertaking the task of making student a professional writer, this class has its goal to familiarize the learner with the dynamics of imaginative literature, the synergy of form and content, and with what makes a particular work effective.

COURSE OBJECTIVES:

1. Discuss with some confidence many of the rhetorical devices, from metaphor to enjambment associated with creative writing.
2. Appreciate the complexity of Poetry, Short Fiction, and Creative Nonfiction.
3. Understand the importance of Creative Writing as a means of self-expression.
4. Read and discuss with enhanced understanding Poetry, Short Fiction, and Creative Nonfiction
5. Show improvement in writing and analytical skills.

UNIT I: Introduction to Literary Forms - Elements of Poetry - Rhythm and Meter Poetic Forms – Ballad, Lyrics, Elegy, Odes, Haiku, Sonnets Literary Genres- Short Fiction, Drama, and Non-Fiction

UNIT II: Poetry Writing - Appreciation of the form and content of poem Techniques - figurative language - (structure - rhythm – imagery – tone – style point of view, voice - read and discuss numerous poems)

Ballad - The Ballad of the Landlord by Langston Hughes; Lyrics - Kubla Khan by Samuel Taylor Coleridge Elegy - Elegy Written in a Country's Churchyard by Thomas Gray Odes – Ode to a Nightingale by John Keats; Haiku - This Other World by Richard Wright Sonnet - On His Blindness by John Milton Students Creative Assignment – Students will write three poems.

UNIT III: Short Fiction / Novel - Elements of Fiction - Character – Plot- Setting – Theme - Style; Narrator - Point of view - Tone – Suspension of Disbelief. Genres - Adventure, Comic, Fantasy, Gothic, Romance, Historical, Horror, Supernatural, Thriller, Science Fiction - Gooseberries by Anton Chekhov Short Story - My Lost Dollar by Stephen Leacock Students Creative Assignment – Students will write one Short Story

UNIT IV: Drama - Elements of Drama - Character Plot, Theme, Dialogue, Convention, Genre, Audience, Stagecraft, Design, Conversions Drama – The King of the Dark Chamber by Rabindranath Tagore Students Creative Assignment- Students will write a review of the drama read in the class.

UNIT V: Non Fiction - Prose, Biography, Memoirs, and Personal Essays Walden or Life in the Woods by Henry David Thoreau Students Creative Assignment - Students will write one or two essays

REFERENCES

1. Candace H. Schaefer, Rick Diamond. 1998. The Creative Writing Guide: A Path to Poetry, Nonfiction, and Drama, Longman, New York, USA
2. Shelly Clark and Marjone Saisa, 2009. Road Trip: Conversations with Writers, The Backwaters Press, Nebraska, USA
3. Nikki Moustaki (ed.), 1998. Writing Fiction: The Practical Guide from New York's Acclaimed Creative Writing School, Publisher: Bloomsbury, ISBN: 0156005743.

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - II

L	T	P	C
3	0	0	3

(R20HMS4188) Design Thinking

Course Objectives:

- To create awareness of design among students of engineering
- To motivate students to think of design before implementing an engineering project
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To instill a sense of significance towards applying creativity to product and service design

Course Outcomes: Upon completion of this course, the student shall be

1. Learn to identify design principles from an engineering perspective
2. Cultivate sensitivity towards design aspects in objects made by engineers and non-engineers, which are typically used in daily life
3. Understand and create visual design elements to communicate more effectively
4. Construct clear problem statements, understand the importance of validation, and design services creatively
5. Develop fundamental team skills: working in teams and managing teams, strategizing tasks, and streamlining activities pertaining to a project

Students' Responsibilities:

1. Students will form teams of 3–5 members each, while working collaboratively throughout the semester.
2. Students will present and report the tasks to the class and to the concerned faculty members and design experts, using their oral and written communication skills as well as creativity and team skills.
3. Students must proactively engage in observing the objects and processes which are part of their daily life and society from a design perspective and discuss with peers to learn collaboratively.

UNIT 1: Design Overview and Motivation History and Context of birth of Design; Design thinking: Introduction and Motivation; Various definitions and interpretations of design, Design Vocabulary; Design in Indian Context; Art and Design: Art in Design, Design beyond Art; Design in Creative Industries

UNIT 2: Design Sensitization for Engineers- Design Engineering vs. Engineering Design, Examples of Engineering Design and Design Engineering in various engineering domains, Examples of design failures leading to bad products and services, Real-world examples of bad design that caused engineering and technological disasters, Domain-specific Engineering Design examples

UNIT 3: Design Thinking Foundations The Design Double Diamond: Discover-Define-Develop-Deliver User-centric design approaches: Importance of user-centricity for design, Empathisation, Empathy Maps, Data collection from users and for users, Data Validation Responsible Innovation and Ethical Design: Ethics as foundation for design, Concern for environment and sustainability

UNIT 4: Communication Skills for Design, Culture and Art Communication Media to express an idea: Visuals, Text, Voice and Audio, Info graphics General guidelines for a good Presentation: Target audience, slideshow templates, appropriate visual elements, presentation styles, guidelines General guidelines for a good Report: Documentation classification, standards, styles, and templates Modes of communication: Reports and documents, Presentation, poster, graphic, blog or website. Understanding Art in Design: Need for creativity, Elements of Visual Design Aesthetics: Influences and impressions of Colors, Shapes, Layouts, Patterns, and Fonts as Design Elements

UNIT 5: Applied Creativity and Design for Services Methods to brainstorm solutions for user issues; Combining solutions to workable solution concepts; Identifying the user needs in a service-driven economy; Process Flows and Customer Experience considerations for designing and improving services; 5 Why's; Service Delivery Pathways. Doing Design Looking for a problem, Ideation and Rules of Ideation, Framing and stating the problem; Basic considerations of Prototyping/ Model Building, Basics of Testing and Validation, Incorporating feedback

TEXT BOOKS:

1. Daniel Ling, "Complete Design Thinking Guide for Successful Professionals", CreateSpace Independent Publishing, 2015 (ISBN: 978-1514202739)
2. Tim Brown, "Change by Design", Harper Business, 2012 (ISBN: 978-0062337382)
3. Jimmy Jain, "Design Thinking for Startups: A Handbook for Readers and Workbook for Practitioners", Notion Press, 2018 (ISBN: 978-1642495034)
4. Beverly Rudkin Ingle, "Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work", APress, 2013 (ISBN: 978-1430261810)

REFERENCES:

1. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)
2. Bruno Munari, "Design As Art", Penguin UK, 2009 (ISBN: 978-0141035819)
3. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)
4. Thomas Lockwood, "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value", Allworth Press, 2009 (ISBN: 978-158115)

Open Elective –III

S. No.	Course Code	Course Title	L	T	P	Credits
1	R20CIV4291	Remote Sensing Concepts	3	0	0	3
2	R20CSE4292	Fundamentals of Soft Computing				
3	R20ECE4293	Audio & Video Engineering				
4	R20EEE4294	Non Conventional Energy Resources				
5	R20INF4295	Information Security Fundamentals				
6	R20MED4296	Total Engineering Quality Management				
7	R20HMS4297	Human Values & Professional Ethics for Engineers				
8	R20HMS4298	Science Fiction				
9		MOOCs - IV				

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OPEN ELECTIVE - III

L	T	P	C
3	0	0	3

(R20CIV4291) Remote Sensing Concepts

COURSE OBJECTIVES: To introduce the concepts of remote sensing processes and its components. To expose the various remote sensing platforms and sensors and to introduce the elements of data interpretation

COURSEOUTCOMES:

1. At the end of the course the student will be able to understand
2. The characteristics of electromagnetic radiation and its interaction with earth features
3. The types and configuration of various satellites and sensors
4. The elements of data interpretation

UNIT I:Remote Sensing and Electromagnetic Spectrum- Definition – components of RS – History of Remote Sensing – Merits and demerits of data collation between conventional and remote sensing methods - Electromagnetic Spectrum – wave theory, particle theory, Stefan – Boltzmann Law and Wien’s Law – visible and non-visible spectrum – Radiation sources: active & passive; Radiation Quantities

UNIT II:EMR Interaction with Atmosphere- Standard atmospheric profile – main atmospheric regions and its characteristics – interaction of radiation with atmosphere - Scattering (Rayleigh, Mie, non-selective scattering) absorption and refraction – Atmospheric effects on visible, infrared, thermal and microwave spectrum – Atmospheric windows.

UNIT III: EMR Interaction with Earth- Energy balance equation – Specular and diffuse reflectors – Spectral reflectance &emittance – Spectro radiometer / Spectrophotometer – Spectral Signature concepts – Typical spectral reflectance curves for vegetation, soil and water body – Factors affecting spectral reflectance of vegetation, soil and water body.

UNIT IV: Platforms and Sensors- Ground based platforms –Airborne platforms – Space borne platforms – Classification of satellites – Sun synchronous and Geosynchronous satellites – Resolution concepts – Scanners - Along and across track scanners – Orbital and sensor characteristics of different satellites – Airborne and Space borne TIR sensors – Calibration – S/N ratio – Passive/Active microwave sensing – Airborne and satellite borne RADAR –SAR –LIDAR , UAV – High Resolution Sensors

UNIT V: Data Products and Visual Interpretation- Photographic (film and paper) and digital products – quick look products - High Resolution data products data - ordering – interpretation – basic characteristics of image elements – interpretation keys (selective and elimination) – visual interpretation of natural resources.

TEXT BOOKS:

1. Richards, Remote sensing digital Image Analysis-An Introduction Springer - Verlag 1993.
2. Lillesand, T.M. and Kiefer R.W. Remote Sensing and Image interpretation, John Wiley and Sons, Inc, New York, 2002.

REFERENCES:

1. Janza, F.Z., Blue H.M. and Johnson,J.E. Manual of Remote Sensing. Vol.I, American Society of Photogrametry, Virginia, USA, 2002.
2. Verbyla, David, Satellite Remote Sensing of Natural Resources. CRC Press, 1995
3. Paul Curran P.J. Principles of Remote Sensing. Longman, RLBS, 2003.

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B.Tech. - IV Year – I Semester

OPEN ELECTIVE - III

L	T	P	C
3	0	0	3

(R20CSE4292) Fundamentals of Soft Computing

COURSE OBJECTIVES: The main objective of the Soft Computing Techniques to Improve Data Analysis Solutions is to strengthen the dialogue between the statistics and soft computing research communities in order to cross-pollinate both fields and generate mutual improvement activities.

UNIT I: Introduction: What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing. Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Back propagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.

UNIT II:Fuzzy Systems: Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

UNIT III: Genetic Algorithm: History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

UNIT 4: Hybrid Systems: Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

UNIT V: GA based Backpropagation Networks:

GA based Weight Determination, K - factor determination in Columns.

Fuzzy Backpropagation Networks: LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks

TEXT BOOKS:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
2. Genetic Algorithms: Search and Optimization, E. Goldberg.
3. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
4. Build_Neural_Network_With_MS_Excel_sample by Joe choong.

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OPEN ELECTIVE - III

L	T	P	C
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(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 Praticce (R.R. Gulati) New Age International.
5. Basic Radio and Television (S. Sharma) Tata McGraw Hill.
6. Colour Television Principles and Praticce (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. Gulati) 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 at 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)

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(R20EEE4294) Non Conventional Energy Resources

This course helps the students to understand the importance, availability, conversion technologies of renewable energy resources and its applications

1. To emphasize the current energy status and role of non-conventional and renewable energy sources.
2. To familiarize various aspects of Solar energy and utilization
3. To familiarize various aspects of Wind energy and utilization
4. To familiarize various aspects of Biomass energy and utilization
5. To emphasize the significance of Green Energy Technologies.

UNIT I: SOLAR ENERGY - Solar radiation its measurements and prediction - Solar thermal collectors - Flat plate collectors, Concentrating collectors – Applications - Heating, Cooling, Desalination, Drying, Cooking, etc - Principle of photovoltaic conversion of solar energy - Types of solar cells and fabrication - Photovoltaic applications - Battery charging, Domestic lighting, Street lighting and water pumping.

UNIT II: WIND ENERGY - Wind energy - Energy chains - Application - Historical background, Merits and limitations - Nature of wind - Planetary and local day / night winds - Wind energy quantum - Power in wind- Turbine efficiency - Torque Thrust calculations Velocity at different heights - Site selection - Components of Wind Energy Conversion System (WECS).

UNIT III: BIOMASS ENERGY - Energy from Biomass - Biomass as Renewable Energy Source - Types of Bio mass Fuels - Solid, Liquid and Gas - Biomass Conversion Techniques- Wet Process, Dry Process-Photosynthesis - Biogas Generation - Factors affecting Biodigestion - Classification of bio gas plant - Continuous, Batch and Fixed Dome types - Advantages and Disadvantages.

UNIT IV: TIDAL, OTEC, HYDEL AND GEOTHERMAL ENERGY - Tidal energy: Tide – Spring tide, Neap tide – Tidal range – Tidal Power – Types of tidal power plant – Single and dual basin schemes – Requirements in tidal power plant - Ocean Thermal Energy Conversion (OTEC): Principle - Open and closed OTEC Cycles - Hydel Energy: Micro hydro - Geothermal Energy: Geothermal energy sources - Power plant and environmental issues.

UNIT V: NEW ENERGY SOURCES - Hydrogen as a renewable energy source - Sources of Hydrogen - Fuel for Vehicles - Hydrogen Production - Direct electrolysis of water, thermal decomposition of water, biological and biochemical methods of hydrogen production - Storage of Hydrogen - Gaseous, Cryogenic and Metal hydride - Fuel Cell – Principle of working, construction and applications.

TEXT BOOKS

1. Rai.G.D, “Non- conventional resources of energy”, Khanna publishers, Fourth edition, 2010.
2. Khan. B.H, “Non-Conventional Energy Resources”, The McGraw Hills, Second edition, 2009.

REFERENCES

1. Rao.S&Parulekar, “Energy Technology”, Khanna publishers, Fourth edition, 2005.
2. Pai.B.R and Ram Prasad.M.S, “Power Generation through Renewable Sources of Energy”, Tata McGraw Hill, New Delhi, 1991.
3. Bansal.N.K, Kleeman and Meliss, “Renewable energy sources and conversion Techniques”,

Tata McGraw hill, 1990.

4. Godfrey Boyl “Renewable Energy: Power Sustainable Future”, Oxford University Press, Second edition, 2006.
5. Ryan O’Hayre, Suk-Won Cha and Whitney colella, “Fuel Cell Fundamentals”, Second edition, 2009.
6. John W Twidell and Anthony D Weir, “Renewable Energy Resources”, Taylor and Francis, 2006.
7. Freris.L.L, “Wind Energy Conversion systems”, Prentice Hall, UK, 1990.

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OPEN ELECTIVE - III

L	T	P	C
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(R20INF4295) Information Security Fundamentals

COURSE OBJECTIVES:

1. To provide impeccable knowledge on various technical aspects of Information Security & Computer Security principles
2. To provide foundation for understanding the key issues associated with protecting Computer Systems & Information Assets.
3. To provide competency in designing consistent & reasonable Information security system with appropriate Scanning & Enumeration mechanisms, determining the level of protection and Response to security incidents.

UNIT I: Introduction to Information Security - Introduction to Information Security, Need for Security - Threats to security & Attacks, Computer System Security and Access Controls - System access and data access.

UNIT II: Communication Security - Introduction to cryptography, cryptosystems, Encryption & Decryption Techniques - classical encryption techniques, communication channel used in cryptographic system, various types of ciphers, Cryptanalysis, Hash function and Data integrity, Security of Hashing function.

UNIT III: Network - Introduction to Network Security, Email Security, IP Security, Web Security, Kerberos, X.509 techniques.

UNIT IV: Scanning & Enumeration Technology - Malicious software, Firewalls, Honey pots, Intrusion Detection system, Intrusion Prevention system

UNIT V: Ethics In Information Security - Implementing Information Security, Legal Ethical & Professional issues in Information Security.

TEXT BOOKS:

1. Matt Bishop, "Computer Security: Art and Science", Addison-Wesley Professional, First Edition, 2003. ISBN: 0201440997.
2. William Stallings, "Cryptography and Network Security", Pearson Education, Fourth Edition, 2006. ISBN: 8177587749

REFERENCES:

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security" Cengage Learning, Fourth Edition, 2010, ISBN: 1111138214
2. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network security: private communication in a public world", Second Edition, ISBN: 0130460192.
3. Dieter Gollmann, "Computer Security", Third Edition, ISBN: 0470741155.

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OPEN ELECTIVE - III

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(R20MED4296) Total Engineering Quality Management

COURSE OBJECTIVE: To understand the Engineering and Management aspects of Planning, Designing, Controlling and Improving Quality in Manufactured products.

COURSE OUTCOMES:

1. To understand the fundamentals of quality
2. To understand the role of TQM tools and techniques in elimination of wastages and reduction of defects
3. To develop quality as a passion and habit

UNIT I: Quality Gurus And TQM Kitemarks - Evolution of TQM – Quality Guru’s – Edward Deming – Joseph Juran – Philip Crosby – Genichi Taguchi – Walter Shewart – Criteria for Deming’s Prize
UNIT II - PRODUCT DESIGN AND ANALYSIS (9 hours) Basic Design Concepts and TQM – Design Assurance – Design Validation – Failure Mode Effect Analysis – Fault Tree Analysis – Design for Robustness – Value Analysis

UNIT-III: Process Improvement and Modern Production Management Tools - Six Sigma Approach – Total Productive Maintenance – Just-In-Time – Lean Manufacturing Paradigms

UNIT IV: Quality Improvement Tools and Continuous Improvement - Q-7 Tools – New Q-7 Tools – Quality Function Deployment – Kaizen – 5S – PokaYoke

UNIT V: Quality Management Systems - Quality Management Systems – Introduction to ISO9000 – TS16949:2002 and EMS14001 certifications.

TEXT BOOKS

1. Total Engineering Quality Management, Sunil Sharma, 1st Edition, MacMillan India Limited.
2. Total Quality Management, Poornima M. Charantimath, 2nd Edition, Pearson Education.

REFERENCES

1. “Quality and Performance Excellence”, James R Evans, Edition, 7th Edition, Cengage Learning.
2. “Quality Management”, Howard S Gitlow, Alan J Oppenheim, Rosa Oppenheim, David M Levine, 3rd Edition, Tata McGraw Hill Limited.
3. “Fundamentals of Quality Control & Improvement”, AmitavaMitra, 3rd Edition, Wiley Publications, 2012.

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OPEN ELECTIVE - III

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(R20HMS4297) Human Values & Professional Ethics for Engineers

Course Objectives:

1. To know the different moral and ethical issues through various prominent theories.
2. To educate the code of ethics as well as the industrial standards and how they can be used for ensuring safety and reducing the risk.
3. To vocalize the Rights and Responsibilities of individuals.
4. To enable the students to imbibe and internalize the Values and Ethical Behavior in the personal and Professional lives.

Course Outcome: The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

UNIT – I Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – II Basic Theories: Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

UNIT – III Professional Practices in Engineering: Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – IV Work Place Rights & Responsibilities, Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research – The US government wide definition of research misconduct, research misconduct distinguished from mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

UNIT – V Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

TEXT BOOKS:

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

REFERENCES

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e ,Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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OPEN ELECTIVE - III

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(R20HMS4298) Science Fiction

COURSE OBJECTIVES: To help learners understand the link between Science and Technology and Humanities, especially Fiction form in Literature, with a view to instilling in them a sensitivity to the current issues of the world and probable issues that will crop up in the future world and imbibe in them a fine sensibility to appreciate and handle with balance the borderline problems of interdisciplinary nature with integrity and responsibility.

COURSE OUTCOMES:

1. To enable the learners to appreciate the literary form of Science Fiction
2. To give them a firsthand linguistic experience of the various types of Science Fiction novels
3. To equip the learners with the discretion to distinguish between a successful/effective science fiction novel and the one not so
4. To enhance the learners' communication skills and to develop their potential for creative writing
5. To spark off the dormant researcher in the learner so that he/she will use it for the betterment of the world

UNIT I: Science Fiction – an Introduction - 1. What is science fiction? Characteristics. 2. Classification 3. Types 4. A Historical Overview

UNIT II: Novels of other Worlds - 1. Utopian Science Fiction Novels Huxley, Aldous. Island.1932; Harper Perennial Classics, 2002. 2. Dystopian Science Fiction Novels Huxley, Aldous. Brave New World.Chatto and Windus, 1962.

UNIT III: Novels of other Beings - 1. Robots and Science Fiction Asimov, Isaac.I Robot.Granada, 1950. 2. Aliens and Science Fiction Card, Orson Scott. Ender's Game. Starscape, 2002.

UNIT IV: Novels of Time Travel -1. Travel into future a. H. G. Well's Time Machine. 2. Travel into past a. Asimov, Isaac and Robert Silverberg. Child of Time.Tor, 1993.

UNIT V : Novels on Women's Issues - 1. Man Controlling Women a. Shelley, Mary. Frankenstein.1818; Barnes and Noble, 2009. 2. Varied Identities of Women b. RUSS, JOANNA. THE FEMALE MAN. BEACON PRESS, 2000

REFERENCES

1. Seed, David. "Science Fiction: A Very Short Introduction". OUP, 2011.
2. Roberts, Adam. "Science Fiction". 2 revised. Routledge, 2005.
3. Moylan, Tom and RaffaellaBaccolini. "Dark Horizons: Science Fiction and the Dystopian Imagination". Routledge, 2003.
4. Little, Judith.A. "Feminist philosophy and science fiction: utopias and dystopias", Prometheus Press, 2007.
5. Atwood, Margaret. "In Other Worlds".Anchor, 2012.
6. Reid, Robin.A. "Women in Science Fiction and Fantasy".Greenwood Press, 2009. 7. Schneider, Susan. "Science Fiction and Philosophy: From Time Travel to Superintelligence", Wiley Blackwell, 2009.
7. Drout, Michael D.C. From "Here to Infinity: An Exploration of Science Fiction Literature",. 7 CDs. Published in 2006 by Recorded Books.
8. Melzer, Patricia. "Alien Constructions: Science Fiction and Feminist Thought", University of Texas Press, 2006.