R G M COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
NANDYAL-518501, KURNOOL DIST., A.P., INDIA

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING
(EEE)

(ESTD-1995)

B.TECH SYLLABUS 2019

Applicable for students admitted into
B.Tech (Regular) from 2019-20
B.Tech (Lateral Entry Scheme) from 2020-21
Regulations, Course Structure & Detailed Syllabus

(Affiliated to J.N.T.U.A, Anantapuramu)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

B.Tech. (Regular) from 2019-20 and B.Tech. (Lateral Entry Scheme) from 2020-21

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

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2019-20 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

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

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

- **i)** Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination certified by Board of Intermediate Education) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or any equivalent examination certified by State Board of Technical Education) for admission.
- **ii)** Secured a rank in the EAMCET examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET, for admission.

Admission Procedure:

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

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

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

- **i)** Candidates qualified in ECET and admitted by the Convener, ECET, in such cases for admission, when needed permission from the statutory bodies is to be obtained.
- **ii)** 10% of the sanctioned strength in each program of study (of RGMCET) shall be filled by the Convener, ECET as lateral entry.

List of Programs offered

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

Academic Regulations for 2019 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2019-2020)

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

1.0 Award of B.Tech. Degree

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

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

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

Table 1: Compulsory Subjects

S.No	SUBJECT PARTICULARS
1	All the subjects offered in B.Tech course / MOOCs
2	Mandatory Learning Courses [Environmental Science, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]
3	All practical subjects
4	All Skill Development Courses/ value added courses
5	Mini projects
6	Comprehensive Viva-Voce
7	Seminar
8	Internship
9	Extra Academic Activities-EAA
10	Life Science
11	Project work Phase-I
12	Project Work Phase-II

2.0 Forfeit of seat

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

3.0 Courses of study

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

1. **Civil Engineering**
2. **Computer Science and Engineering**
3. **Electrical and Electronics Engineering**
4. **Electronics and Communication Engineering**
5. **Mechanical Engineering**

Table 2: Credits

Subject	Semester			
	Periods/ Week	Credits	Internal Marks (IM)	External Marks (EM)
Theory	2+1*	03	30	70
English Theory	2+1*	02	30	70
Life Science	02	02	30	70
Mandatory Learning Courses	03	00	00	00
Mini project/ Practical	03	1.5	25	50
Drawing	03	03	30	70
Skill Development Courses/Value Added Course	1+2*	0.5**	30	70
Comprehensive Viva (CV)	--	0.5	00	50
Extra Academic Activities	02	00	00	00
Seminar		0.5	50	00
Internship		1.0	00	Certificate from Internship Agency
Project Phase-I		1.0	25	00
Project Phase-II	--	08	25	100

* Tutorial

** [Skill Development / value Added Courses credits will not be considered for the award of division.

However, all these courses have to be cleared through internal evaluation by scoring minimum of 40% marks. The credits obtained in Skill development courses will be taken in to account for the award of degree.]

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

4.0 Distribution and Weightage of Marks

4.1 The performance of the student in each semester shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, mini-project, Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 150 marks.

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

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

that internal component (marks) will be 30 marks (20 marks for internal test+10 marks for assignments / field work/group task).

Table 3: Units for Internal Tests

Semester
3 Units First Internal test
3 Units Second Internal test

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

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

4.6 Open and Professional Electives will commence from 3rd year Second semester onwards. The open elective offered in 3-2 semester will be based on self-study/MOOCs. All the students have to opt for the MOOCs (Self Study) and should acquire the required credits. If the student fails to opt for MOOCs, (Under unavoidable circumstances) he/she has to write two internal tests besides the end examination conducted by the institute (Elective offered in place of MOOCs by the Dept.) like other subjects. However, he/she has to obtain the certificate from the organization in which he has registered. Any MOOCs course selected by the student should be of more than 45 hours duration /12 weeks course with minimum of 3 credits and also from the reputed organization. Attendance of the student who has opted for MOOCs will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to the next semester. Attendance will not be recorded for MOOCs.

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

If the assessment certificate is submitted

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

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

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

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

4.7 Gap Year – Concept of student Entrepreneur in Residence shall be introduced and the outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue full time entrepreneurship. This period may be extended for another one year (two years in total) and this period would not be counted for the maximum duration for completion of graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and committee shall decide on permitting the student for having the Gap Year. The committee consists of Principal as Chairman and all HODs as members.

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

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

4.10 The institute would like to offer **Honours** and **Minor** as optional feature of the B. Tech program aimed at providing additional learning opportunities for academically motivated and bright students. In order to earn Honours or Minor, student has to earn a minimum of 20 extra credits. For this in addition to the regular subjects, a student has to pursue (Self-study/MOOCs) five additional subjects from 3-1 semester onwards and acquire the required credits. The Minor is indicated by separate CGPA and is reflected in the degree certificate as for example, B.Tech in ECE with Minor in Artificial Intelligence. Each department shall offer at least one Minor and also Honours. The student has to select the subjects which are not studied in their regular course and student should have cleared all the subjects up to and including 2-1 semester with above 8.5 CGPA (for SC/ST students 8.0 CGPA) to become eligible for registration for Honours/Minor. GPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor/Honours discipline registration active else Minor/Honours registration will be cancelled. The breakup of the credits are 5 subjects which carry 15 credits @3 credits per subject and project work carries 5 credits. The evaluation pattern of subjects and project work will be similar to methods followed in regular course evaluation. No attendance minimum will be considered for Honours/Minor. Not more than two subjects are allowed for registration in any semester for Honours/ Minor. The student is eligible to receive B.Tech with Honours if he acquires the required additional credits in the same discipline in which he is pursuing his B.Tech degree. If the students acquire the additional credits from other disciplines then he is eligible to receive B.Tech along with Minor degree in the specified area. Minimum strength for

offering Minor/Honours in a discipline is considered as One-Fifth (20% of the class) of the class size and Maximum size would size would be Four-Fifth of Class size (i.e 80% of the class).

4.11 Extra - Academic Activity (EAA)

Each of the following activities carries 0 credits and every student is required to register for **two** activities during second year of study (one in each semester) which is mandatory.

a) ***NSS/NCC***
b) ***Games and Sports***
c) ***Yoga/Meditation***
d) ***Extension Activities***
e) ***Literary/ Cultural Activities***

Any other which may be offered in future.

The activities shall be carried out in the allotted hours. The activities will be monitored by the respective faculty in charge, senior faculty member of the department and the Department HOD. Grades will be awarded on the basis of participation, attendance, performance and behavior. Grades shall be entered in the marks statement as GOOD, SATISFACTORY and UNSATISFACTORY and shall not be counted towards CGPA calculation. If any student gets an Unsatisfactory Grade, he/she has to repeat the activity in the immediate subsequent year.

4.12 The student has an option of going for internship in IV year, II Sem in a reputed organization (The finalization of the internship organization will be as per college guidelines (HOD, two Senior faculty members of the department and same will be recommended to the Principal for approval). In case any student opted for internship he need not attend the classes however he has to write internal and external examination of subjects when ever conducted in that semester and acquire the required credits. The project work in the final semester may be carried out during the internship and same may be submitted for evaluation. Student has to acquire 01 credit by going for internship (minimum of Two weeks) / carrying out internal project work/ study project report on any industry/ attending workshop in reputed institutions for two weeks. Certificate from the organization has to be submitted to this effect attested by Head of the Department and internship incharge to the academic section before the commencement of 3-2 semester. Student is expected to carry out the activities mentioned here during the summer break before the commencement of 3-1 semester.

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

5.0 Question Paper Pattern

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

5.2 The End Examination question paper will have 7 questions and students have to answer5 questions. However, the first question is compulsory and it consists of 7 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 14 marks. Each 14 marks question shall have a, b, c .. parts. Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

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

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

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

5.6 There shall be two Mini-Projects, in collaboration with an industry/EPICS (Engineering Projects In Community Services) (wherever is possible) of their specialization, to be taken up during the vacation (data collection, components etc.) after II year II Semester and III Year II Semester examination and implementation/ simulation shall be carried out in III year I Semester and IV Year I Semester during lab classes. Implementation or fabrication/simulation of mini projects will be treated as laboratory. However, the mini project and its report shall be evaluated in III year I Semester and IV Year I Semester. The mini project shall be submitted in the report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external Examiner, Head of the Department and the supervisor of mini project. There shall be 25 internal marks for mini project which will be awarded based on the performance and involvement of the student during mini project period.

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

5.8 The project topic should be approved by Internal Department Committee (IDC). Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation (25 marks for Phase-I and 25 marks for Phase-II) and 100 marks for the End Semester Examination. The evaluation of project work phase-I shall be conducted at the end of the IV year I semester and Phase-II shall be conducted at the end of the IV year II semester. The project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of two seminars (25 marks for Phase-I and 25 marks for Phase-II) given by each student on the topic of the project. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

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

5.10 **Revaluation of End Examination Scripts**: Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee. Procedure for

Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table4: Distribution of weightages for examination and evaluation

Sl. No.	Nature of subject	Marks	Type of examination and mode of assessment		Scheme of Examination
1	Theory	70	End Examination. Both internal and external Evaluation (at least a minimum of 50% subjects will be sent for external evaluation)		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test (Objective Type) (Internal evaluation)	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
2	Practical	50	End lab examination (External evaluation)		This End Examination in practical subjects will be for a maximum of 50 marks.
		25	15	Internal evaluation	Day-to-day performance in lab experiments and record.
			05	Internal evaluation	Internal lab examination at the end of year/semester
			05	Internal evaluation	05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc.
3	Mini Project	50	End Examination (External evaluation)		This End Examination in mini project will be for a maximum of 50 marks.
		25	Internal evaluation		Day-to-day performance in executing mini project.
4	Comprehensive Viva-Voce(CV)	50	External evaluation		This end viva voce examinations in all the subjects for 50 marks.
5	Project work	100	External evaluation		This end viva voce in project

					work for 100 marks
		50	Internal evaluation 25 marks for Phase-I 25 Marks for Phase-II		These 50 marks will be based on the performance of the student in the project reviews apart from attendance and regularity(25 marks for Phase-I and 25 marks for Phase-II)
6	Skill Development Courses/ Value Added Course/ Mock interviews and Group Discussion	30	Internal evaluation		These 30 marks are awarded to the students based on the performance of two Internal examinations with a weight age of 0.75 for better score and 0.25 for the other score.
		70	Internal Evaluation		Based on the performance in the end examination.
7	Internship/Internal Project/Study Report/Work shop	00	-		Certificate form Internship Agency
8	Life Science	70	External Evaluation		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test (Objective Type) (Internal evaluation)	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
9	EAA	00	Internal evaluation		Based on performance and committee report.
10	Mandatory Learning Courses	00	Internal evaluation		No examinations. Attendance minimum is required

6.0 Attendance Requirements:

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

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

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

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

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

6.6 The stipulated fee shall be payable towards condonation of shortage of attendance.

7.0 Minimum Academic Requirements:

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

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

7.2 The student shall be promoted from II to III year only if he fulfils the academic requirement of securing a minimum of 40.5 credits out of 81 credits from all the exams conducted up to and including II year II semester regular examinations irrespective of whether the candidate takes the examination or not.

7.3 The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 61.5 credits out of 123 credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

Table 5: Promotion rules

Promotion from	Total credits to register	Minimum credits to obtain for promotion
II yr to III yr	81	40.5
III yr to IV yr	123	61.5

7.4 The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 157 credits (excluding the credits obtained in Skill Development Courses/Value added courses) shall be considered for the calculation of CGPA.

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

8.0 Course pattern:

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

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

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Table: 6: Course pattern

Year	Semester	No. of Subjects		No. of Skill Development Courses	Number of Labs		Total credits	
First Year	First	CE/ME/CSE	ECE/EEE	00	CE/ME/CSE	ECE/ EEE	4X3=12 1x2=02 3X1.5=4.5 1x0.5=0.5	19
		05 {CE-I-HSMC LAC-BSC MEC/AC-BSC PEE/EM/BEM-ESC PPS-I-ESC	05 {CE-I-HSMC LAC-BSC AP-BSC ED-ESC PPS-I-ESC}		EC lab-BSC PPS-I Lab-ESC DEL Lab-HSMC CV-I	EP Lab-BSC PPS-I Lab-ESC EW&ITW-LC CV-I		
	Second	05 {CE-II-HSMC OPDEVC-BSC AP/EP-BSC ED-ESC PPS-II-ESC}	05 {CE-II-HSMC OPDEVC-BSC MEC-BSC NA/BEE-ESC PPS-II-ESC}	00	EP lab-BSC PPS-II Lab-ESC EW&ITW-LC CV-II	EC lab-BSC PPS-II Lab-ESC DEL Lab-HSMC CV-II	4X3=12 1x2=02 3X1.5=4.5 1x0.5=0.5	19
Second Year	First	BSC Life Science Four Subjects	BSC Life Science Four Subjects	01	Subjects		5X3=15	22.5
					Life Science		1x2=2.0	
					Labs		3x1.5=4.5	
					CV (Comprehensive Viva)-III		1X0.5=0.5	
					SDC/VAC		1x0.5=0.5	
					EAA		No Credits	
	Second	MC-I/MC-2/MC-3 Five Subjects SDC/VAC	MC-I/MC-2/MC-3 Five Subjects SDC/VAC	01	Subjects		5X3=15	20.5
					Labs		3X1.5=4.5	
					CV (Comprehensive Viva)-IV		1X0.5=0.5	
					SDC/VAC		1x0.5=0.5	
					Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Mandatory Course-3 (Constitution of India)		No Credits	
					EAA		No Credits	
Third Year	First	Five Subjects SDC/VAC MC-I/MC-2/MC-3	Five Subjects SDC/VAC MC-I/MC-2/MC-3	01	Subjects(05S)		5X3=15	20.5
					Labs		3X1.5=4.5	
					SDC/VAC		1x0.5=0.5	
					CV (Comprehensive Viva)-V		1X0.5=0.5	
					Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)		No Credits	
	Second	03S + OEC1(MOOCs) + PEC1 MC-I/MC-2/MC-3	03S + OEC1(MOOCs) + PEC1 MC-I/MC-2/MC-3	01	Subjects(03S, OEC1, PEC1)		5X3=15	21.5
					Labs		2x1.5=3.0	
					Mini Project-1(EPICS)		1x1.5=1.5	
					SDC/VAC		1X.5=0.5	
					CV (Comprehensive Viva)-VI		1X0.5=0.5	
					Internship		1x1.0=1.0	
					Mandatory Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Mandatory Course-3 (Constitution of India)		No Credits	
Fourth Year	First	1S+PEC2+PEC3/(MOOCs)+PEC4+OEC2		01	Subjects (01S, PEC2, PEC3, PEC4, OEC2)		5X3=15	21.5
					Labs		2X1.5=03	
					SDC/VAC		1X0.5=0.5	
					CV (Comprehensive Viva)-VII		1X0.5=0.5	
					Project Phase 1		1x1.0=1.0	
					Mini project-2 (EPICS)		1X1.5=1.5	
	Second	PEC5 + OEC3		01	Subjects (PEC5, OEC3)		2X3=06	15.5
					SDC/VAC		1X0.5=0.5	
					CV (Comprehensive Viva)-VIII		1X0.5=0.5	
					Seminar		1x.5=0.5	
					Project Phase-2/Internship		1X8=08	
							GRAND TOTAL	**160**
MC-1 (Environmental Studies), MC-2 (Indian Heritage, Culture Tradition), MC-3 (Constitution of India)								

9.0 Transitory Regulations:

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

10.0With-holding of results:

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

11.0Award of Class:

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

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	CGPA secured from 157 Credits (Excluding the credits obtained in Skill Development Courses)
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 and < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 and < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 and < 5.5	

12.0Grading*:*

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

Table 8: Conversion into Grades and Grade points assigned

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

12.1Requirement for clearing any subject: The students have to obtain a minimum of 35% in End Examination and they have to score minimum of 40% marks from

Internal and external exam marks put together to clear the subject. Otherwise they will be awarded fail grade.

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

12.3 In case of skill development/ value added course / soft skill subjects, as there is no end exam, all 100 marks are for internal assessment only. Student has to score 40% in these courses to complete the subject which will be evaluated internally. Marks obtained in these courses shall not be considered for award of Division.

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

13.0 Supplementary Examinations:

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

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

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

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

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

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

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

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

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

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

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

15.0 Grade Sheet:

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

16.0 Award of Degree

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

(i) The student joining with Intermediate qualification must have, after admission into the Regular B.Tech programme of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.
(ii) The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.
(iii) The student must have satisfied the minimum academic requirements in appropriate branch of engineering in each semester of the program, herein after prescribed.
(iv) Students must register for all the courses and earn the credits specified
(v) Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech course and their admission stands cancelled.
(vi) The student shall successfully complete non-credit courses like EAA/MC/Internship.
(vii) The student has no dues to the institution, library, hostels etc.
(viii) The student has no disciplinary action pending against him/her.

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

17.0 Transcripts:

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

18.0 Rules of Discipline:

18.1 Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.
18.2 When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.
18.3 When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).
18.4 When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

19.0 Minimum Instruction Days:

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

20.0 Amendment of Regulations:

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

21.0 Transfers

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

22.0 General:

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

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

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

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

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

(Effective for the students getting admitted into II year from the Academic Year 2020-2021 onwards)

1.0 The Students have to acquire a minimum of 122 credits out of 122 from II to IV year of B.Tech. Program (Regular) for the award of the degree.

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

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

4.0 Promotion Rule:

The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 42.5 credits out of 85 credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

5.0 Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes: The marks obtained in the best 119 credits will be considered for the calculation of percentage and award of class.

Table 1: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	CGPA secured from 119 Credits (Excluding the credits obtained in Skill Development Courses)
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	
First Class	Below 70% but not less than 60%	First Class	$6.5 and < 7.5$	
Second Class	Below 60% but not less than 50%	Second Class	$\geq 5.5\ and < 6.5$	
Pass Class	Below 50% but not less than 40%	Pass	$\geq 4\ and < 5.5$	

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

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I B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0001191	Communicative English - I	1	1	-	2	30	70	100
A0002191	Linear Algebra and Calculus	2	1	-	3	30	70	100
A0004191	Applied Physics	2	1	-	3	30	70	100
A0301191	Engineering Drawing	2	1	-	3	30	70	100
A0501191	Programming for Problem Solving - I	2	1	-	3	30	70	100
Practicals								
A0094191	Engineering Physics Lab	-	-	3	1.5	25	50	75
A0591191	Programming for Problem Solving – I Lab	-	-	3	1.5	25	50	75
A0592191	Engineering Workshop and IT Workshop	-	-	3	1.5	25	50	75
A0093191	Comprehensive Viva - I	-	-	-	0.5	-	50	50
	Contact Periods / Week	**9**	**5**	**9**	**19**	**225**	**550**	**775**

I B.TECH, II-SEMESTER COURSESTRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory/ Practical		Internal	External	Total
Theory								
A0006192	Communicative English - II	1	1	-	2	30	70	100
A0007192	Ordinary, Partial Differential Equations and Vector Calculus	2	1	-	3	30	70	100
A0005191	Modern Engineering Chemistry	2	1	-	3	30	70	100
A0202192	Fundamentals of Electrical and Electronics	2	1	-	3	30	70	100
A0502192	Programming for Problem Solving - II	2	1	-	3	30	70	100
Practicals								
A0091191	Engineering Chemistry Lab	-	-	3	1.5	25	50	75
A0593192	Programming for Problem Solving – II Lab	-	-	3	1.5	25	50	75
A0092191	Digital English Language Lab	-	-	3	1.5	25	50	75
A0095192	Comprehensive Viva - II	-	-	-	0.5	-	50	50
	Contact Periods / Week	**9**	**5**	**9**	**19**	**225**	**550**	**775**

II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0012193	Transformation Techniques and Complex Variables	2	1	-	3	30	70	100
A0302193	Fluid Mechanics and Hydraulic Machinery	2	1	-	3	30	70	100
A0401193	Analog Electronics and Op-Amp Circuits	2	1	-	3	30	70	100
A0205193	Field Theory	2	1	-	3	30	70	100
A0206193	Electrical Circuit Analysis	2	1	-	3	30	70	100
Life Sciences								
A0010193	Biology for Engineers	2	-	-	2	30	70	100
Skill Development Course								
A0011193	Aptitude Arithmetic Reasoning and Comprehension	1	2	-	0.5	30	70	100
Practicals								
A0491193	Electronic Devices and Circuits Lab	-	-	3	1.5	25	50	75
A0391193	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	1.5	25	50	75
A0292193	Circuit Theory and Simulation Lab	-	-	3	1.5	25	50	75
A0096193	Comprehensive Viva - III	-	-	-	0.5	-	50	50
Contact Periods / Week		**13**	**7**	**9**	**22.5**	**285**	**690**	**975**

II B.TECH, II-SEMESTER COURSESTRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0503193	Python Programming	2	1	-	3	30	70	100
A0405194	Digital Electronics	2	1	-	3	30	70	100
A0208194	Generation and Distribution of Electric Power	2	1	-	3	30	70	100
A0209194	Control Systems	2	1	-	3	30	70	100
A0210194	Electrical Machines-I	2	1	-	3	30	70	100
Mandatory Learning Course - I								
A0017194	Indian Heritage & Culture	2	-	-	-	-	-	-
Skill Development Course								
A0016194	Design Thinking for Innovations	1	2	-	0.5	30	70	100
Practicals								
A0594193	Python Programming Lab	-	-	3	1.5	25	50	75
A0493194	IC and PDC Lab	-	-	3	1.5	25	50	75
A0294194	Control Systems and Simulation Lab	-	-	3	1.5	25	50	75
A0097194	Comprehensive Viva - IV	-	-	-	0.5	-	50	50
	Contact Periods / Week	**13**	**7**	**9**	**20.5**	**255**	**620**	**875**

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III B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0211195	Electrical Machines –II	2	1	-	3	30	70	100
A0212195	Transmission of Electrical Power	2	1	-	3	30	70	100
A0213195	Power Electronics	2	1	-	3	30	70	100
A0214195	Electrical Measurements and Instrumentation	2	1	-	3	30	70	100
A0414195	Basics of Signals and Systems	2	1	-	3	30	70	100
Skill Development Course								
A0215195	Sensors and actuators	1	2	-	0.5	30	70	100
Mandatory Learning Course - II								
A0015194	Environmental Science	2	-	-	-	-	-	-
Practicals								
A0295195	Electrical Machines-I lab	-	-	3	1.5	25	50	75
A0296195	Electrical Measurements Lab	-	-	3	1.5	25	50	75
A0297195	Power Electronics lab	-	-	3	1.5	25	50	75
A0098195	Comprehensive Viva-V	-	-	-	0.5	-	50	50
	Contact Periods / Week	**13**	**7**	**9**	**20.5**	**255**	**620**	**875**

III B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Lecture/ Theory	Tutorial	Laboratory / Practical		Internal	External	Total
Theory								
A0216196	Electrical Machines-III	2	1	-	3	30	70	100
A0217196	Power System Protection	2	1	-	3	30	70	100
A0218196	Power Semi-Conductor Drives	2	1	-	3	30	70	100
Program Elective - I		2	1	-	3	30	70	100
A0219196	Power System Analysis							
A0220196	Energy Management & Audit							
A0221196	Power System Harmonics							
Open Elective – I/MOOCs		2	1	-	3	30	70	100
A0512195	Core JAVA Programming							
A0508194	Computer Organization and Architecture							
A0517195	Web Programming							
Skill Development Course								
A0222196	Arduino Programming	1	2	-	0.5	30	70	100
Mandatory Learning Course - III								
A0018194	Constitution of India	2	-	-	-	-	-	-
Practicals								
A0298196	Instrumentation Lab	-	-	3	1.5	25	50	75
A0299196	Electrical Machines-II Lab	-	-	3	1.5	25	50	75
A0082196	Mini Project-1	-	-	3	1.5	25	50	75
A0081196	Comprehensive Viva-VI	-	-	-	0.5	-	50	50
A0099196	Internship	-	-	-	1	-	-	-
	Contact Periods / Week	**13**	**7**	**9**	**21.5**	**255**	**620**	**875**

IV B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week				Marks		
		Theory	Tutorial	Lab	Credits	Internal	External	Total
Theory								
A0223197	Power System Control and Stability	2	1	0	3	30	70	100
Professional Elective-II		2	1	0	3	30	70	100
A0224197	Smart Grid technologies							
A0225197	Power Quality							
A0226197	Optimization Techniques							
Open Elective-II /MOOCs		2	1	0	3	30	70	100
A0227197	High Voltage Direct Current Transmission							
A0228197	High Voltage Engineering							
A0511194	Database Management Systems							
Professional Elective -III		2	1	0	3	30	70	100
A0424197	Embedded Controllers							
A0425197	Microcontroller Based System Design							
A0229197	Robotic Control System							
Professional Elective-IV		2	1	0	3	30	70	100
A0230197	Fundamentals of Electric and Hybrid Electric Vehicle							
A0231197	Power Electronics for Renewable Energy Systems							
A0426197	VLSI Design							
Skill Development Course								
A0534197	Structured Query Language	1	2	0	0.5	30	70	100
Practicals								
A0285197	Power Systems Lab	0	0	3	1.5	25	50	75
A0482197	Embedded Controllers Lab	0	0	3	1.5	25	50	75
A0084197	Mini Project - II	0	0	3	1.5	25	50	75
A0083197	Main Project Phase-I	0	0	0	1	25	0	25
A0085197	Comprehensive Viva-VII	0	0	0	0.5	0	50	50
	Contact Periods / Week	**11**	**7**	**9**	**21.5**	**280**	**620**	**900**

IV B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name Of The Subject	Hours/Week				Marks		
		Theory	Tutorial	Lab	Credits	Internal	External	Total
Theory								
Professional Elective-V		2	1	0	3	30	70	100
A0232198	Utilization of electrical energy							
A0233198	Elements Of Smart Grid System							
A0234198	Advanced Control System							
Open Elective-III		2	1	0	3	30	70	100
A0235198	Wind and Solar Energy Conversion Systems							
A0236198	Special Machines							
A0418196	Digital signal processing							
Skill Development Course								
A0025198	Group Discussion and Mock Interview	1	2	0	0.5	30	70	100
Practicals								
A0086198	Seminar	0	0	0	0.5	50	0	50
A0087198	Project Phase-II/ Internship	0	0	0	8	25	100	125
A0088198	Comprehensive Viva - VIII	0	0	0	0.5	0	50	50
	Contact Periods / Week	5	4	0	15.5	165	360	525

I B.Tech, I-Sem (EEE)

L	T	C
1	1	2

(A0001191) COMMUNICATIVE ENGLISH- I

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- Communicative English-I is prescribed to make students communicate their thoughts, opinions and ideas freely and in real life situations. It has been framed with basics of English usage covering LSRW (Listening, Reading, Speaking and Writing Skills) with suitable practice versions. Further, this course is designed to update the learner in relevant English skills to face campus recruitments and other competitive exams.

COURSE OUTCOMES:

- Develop speaking, reading skills by prescribed lesson. Understand basic grammar principles.
- Write effective letters for job application and complaints, Enhance reading comprehension.
- Comprehend English speech sound system, stress and Intonation, Understand the usage of Vocabulary.
- Enhance reading comprehension, Vocabulary, Speaking, Grammar.
- Acquire knowledge in writing skills, learn Grammar usage and interpret the poem.

MAPPING WITH COs & POs

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

UNIT-1

Speaking - Describing Home Towns - Hobbies - Reading - Essay - My Vision for India by APJ. Abdul Kalam, (http://www.studypage.in) Essay Writing Practice - Remedial Grammar - Practice - Standard Abbreviations & Acronyms

UNIT-2

Writing - Principles of Punctuation - Prewriting Techniques - Letter formats - Formal letter - Writing - Practice - Techniques of Spelling - Reading Comprehension Skills - Practice

UNIT-3

Listening & Speaking - Introduction to English Pronunciation - Minimal Pairs Practice - Words with complex pronunciation - Movie Analysis - Discussion - Grammar & Vocabulary - Concord - Idioms & Phrases - Practice

UNIT-4

Reading - Skimming and Scanning - What is a Drone: Main Features & Applications of Today's Drones by Jack Brown - Vocabulary - Computer Terminology - Phrasal Verbs - Speaking - Current Affairs - Discussions - Grammar & Usage - Articles & Prepositions - Practice.

UNIT-5

Writing: Structure of Paragraph Writing - Cause and Effect - Compare and Contrast -Practice - Techniques - Report writing - Official Reports - Business Reports - Practice -Grammar & Usage - Conditional sentences - IF Poem by Rudyard Kipling.

UNIT-6

Listening & Speaking - Indian English Variants - Difference between British and American English - Listening comprehensions - Test - Remedial Grammar - Correction of Sentences - Sentence Completions - Movie Analysis – Debate

REFERENCE TEXT BOOKS:

1) English Language & Communication Skills for Engineers (AICTE Syllabus**)** by Sanjay Kumar & Pushpa Latha, Oxford University Press, 2018
2) Practical English Usage by Michael Swan, Oxford University Press.
3) The Definitive Guide to IELTS Academic Writing, Oxford University Press, 2019.

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I B.Tech, I-Sem (EEE)

L	T	C
2	1	3

(A0002191) LINEAR ALGEBRA AND CALCULUS

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The essential tool of matrices and linear algebra in a comprehensive manner.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- To deal with functions of several variables that are essential in most branches of engineering.
- Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The mathematical tools needed in evaluating multiple integrals and their usage

COURSE OUTCOMES:

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

- Understand the use of matrices and linear system of equations in solving problems such as Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Apply the concept of Gamma and Beta functions linear digital signal processing, discrete Fourier transform, digital filters and Oscillatory theory in engineering.
- Analyze differential and integral calculus to solve improper integrals and its applications in many engineering disciplines.
- Determine the process to evaluate double and triple integrals and understand its usage to find surface area and volumes of various bodies in engineering.
- Identify the applications of advanced calculus & Linear algebra in electro-magnetic theory and in telecommunication engineering.

MAPPING WITH COs & POs

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

UNIT-1

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

UNIT-2

Eigen Values, Eigen vectors – Properties; Cayley – Hamilton Theorem (without proof) – Inverse and Power of a matrix by Cayley – Hamilton theorem.

UNIT-3

Quadratic forms: Linear Transformation – Reduction of quadratic form to canonical form and their nature.

UNIT-4

Mean value theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Taylor's and Maclaurin's Series for e^x, sinx, cosx and log(1+x)

Functions of several variables – Jacobian – Maxima and Minima of functions of two variables - Lagrange's method of Multipliers with three variables only.

UNIT-5

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

UNIT-6

Multiple integrals: – Evaluation of Double integrals (Cartesian and Polar) – Change of Variables – Change of order of Integration – Evaluation of triple integrals.

TEXT BOOKS/REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,
   2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5) T.K.V. Iyengar, B. Krishna Gandhi and Others, Mathematical Methods, S. Chand & Company.
6) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol – 1,
   S. Chand & Company.
7) S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa publishing.

I B.Tech, I-Sem (EEE)

L	T	C
2	1	3

(A0004191) APPLIED PHYSICS

(For Branches EEE, ECE & CSE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After the completion of the course the students will be able to:

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

MAPPING WITH COs & POs:

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

UNIT I: WAVE – OPTICS

Interference: Introduction – Division of amplitude – Newton's rings and its applications.
Diffraction: Introduction – Fraunhofer diffraction at single slit – Diffraction Grating – Grating spectra – Determination of wavelength of light.
Polarization: Introduction to polarization – Applications

UNIT II: QUANTUM MECHANICS

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

UNIT III: QUANTUM OPTICS & FIBER OPTICS

Lasers: Characteristics – Einstein's coefficients – Radiation processes – Population inversion – Pumping processes Lasing action – Nd-YAG and He-Ne lasers – Engineering applications
Fiber Optics: Structure – Principle – Acceptance angle, Numerical aperture – Propagation of light in Step-index and Graded-index fibers – Applications: Fibre optic communication system (Block diagram) – Sensors.

UNIT IV: THE CRYSTAL STRUCTURE OF SOLIDS

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

UNIT V: FREE ELECTRON THEORY & BAND STRUCTURE OF SOLIDS

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

UNIT VI: SEMICONDUCTOR PHYSICS & DEVICES

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

TEXT BOOKS:

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

REFERENCES:

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

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I B.Tech, I-Sem (EEE)

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(A0301191) ENGINEERING DRAWING

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- Increase ability to communicate with people
- Learn to take data and transform it into graphic drawings.
- Learn basic engineering drawing formats
- Prepare the student for future Engineering positions

COURSE OUTCOMES:

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

- Understand the theory of orthographic projection.
- Understand the conventions and the methods adopted in engineering drawing.
- Know the importance of sectioning and Developments of solids in actual applications.
- Improve their visualization skills so that they can apply these skills in developing new products.

MAPPING WITH COs & POs:

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

UNIT-1

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

UNIT-2

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

UNIT-3

Projections of Planes- Regular Planes Perpendicular / Parallel to one Reference, Plane and inclined to other Reference Plane.

UNIT-4

Projections of Solids-Prisms, pyramids, cones and Cylinders with the axis inclined to one Plane.

UNIT-5

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

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

UNIT-6

Conversion of Isometric Views to Orthographic Views/Projections-Conversion of Orthographic Views to Isometric Projection/ Views.

TEXT BOOK:

1) Engineering Drawing by N.D. Bhatt, Chariot Publications.
2) Engineering Drawing and Graphics, Venugopal/New age publications.

REFERENCE BOOKS:

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications.
2) Engineering Drawing, B.V.R Gupta, J.K. Publishers.
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers.

4) Engineering Drawing, Johle, Tata Mc Graw - Hill.
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai (2006).

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(A0501191) PROGRAMMING FOR PROBLEM SOLVING-I

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To make students aware about fundamentals of computer programming.
- To provide exposure on C programming language
- To provide exposure on various C programming concepts like arrays, functions, pointers, Structures etc.
- To develop solutions for various problems by using C programming language.

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Design algorithms and flowcharts for real world applications
- Know the usage of various operators in Program development
- Design programs involving decision and iteration structures.
- Apply the concepts code reusability using Functions
- Analyse the concepts of Arrays and Strings for real world problems.
- Able to apply the pointers in programs

MAPPING WITH COs & POs:

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

UNIT-1

Problem Solving Using Computers: Introduction, Algorithms, Flowcharts and pseudo code.

Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input Output Statements with suitable illustrative "C" Programs.

UNIT-2

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative C Programs.

UNIT-3

Statements in C: Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, Switch-Statement and goto statement with suitable illustrative C Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue statements.

UNIT-4

Arrays: Definition, Importance of an array in C language, One-Dimensional Arrays, Two-Dimensional Arrays, Example programs on the topics mentioned above.

Strings: Introduction to Strings, String I/O, String Operations with and without built-in functions

(strlen( ), strcmp( ), strcat( ),strcpy( ), and strrev( )) Example Programs on the topics mentioned above

UNIT-5

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs. exit( ), Parameter Passing mechanisms, Call-by-Value, Recursion, Storage Classes, preprocessor directives

UNIT-6

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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(A0094191) ENGINEERING PHYSICS LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of the course the students will be able to

- Operate optical instruments like microscope and spectrometer.
- Determine thickness of a hair/paper with the concept of interference.
- Estimate the wavelength of different colors using diffraction grating.
- Measure the resolving power of the given optical device.
- Study the variation of intensity of the magnetic field due to circular coil carrying current with distance.
- Evaluate the acceptance angle of an optical fibre and numerical aperture.
- Calculate the band gap of the given semiconductor using four probe method.
- Identify the type of semiconductor (i.e., n-type or p-type) using Hall Effect.

MAPPING WITH Cos & POs:

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

LIST OF EXPERIMENTS (ANY10 EXPERIMENTS)

1) Determination of wavelength of light – Newton's rings
2) Determination of thickness of a thin film
3) Spectrometer – Transmission grating
4) Determination of wavelength of a Sodium light – Normal Incidence
5) Dispersive power of a prism - spectrometer
6) Laser experiment: wavelength determination using grating
7) Laser experiment: particle size determination
8) Determination of numerical aperture of an optical fiber
9) Field along the axis of coil carrying current – Stewart Gee's method
10) Determination of rigidity modulus – Torsional Pendulum
11) Determination of Band gap of Si or Ge – Four probe method
12) Study of B – H Curve.
13) Determination of Charge density and Hall coefficient or magnetic flux density – Hall effect.
14) Study of I-V characteristics of Solar Cell.
15) Measurement of Dielectric constant

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(A0591191) PROGRAMMING FOR PROBLEM SOLVING – I LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OUTCOMES:

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

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Apply the specification of syntax rules for numerical constants and variables, data types
- Know the Usage of various operators and other C constructs
- Design programs on decision and control constructs
- Develop programs on code reusability using functions
- Implement various concepts of arrays and strings

MAPPING WITH Cos & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUREMENTS:

- Intel based desktop PC with ANSI C Compiler and Supporting Editors

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

Exercise-1

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

Exercise-2

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

Exercise-3

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

Exercise-4

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

0
111
22222
3333333
444444444

Exercise-5

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

Exercise-6

Write a C program to perform the following operations:

a) Addition of Two Matrices
b) Multiplication of Two Matrices
   [Note: Use functions to implement the above specified operations]

Exercise-7

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

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

Exercise-8

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

Exercise-9

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

Exercise-10

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

Exercise-11

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

Exercise-12

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

REFERENCE BOOKS

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

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(A0592191) ENGINEERING WORKSHOP AND IT WORKSHOP

(For Branches: CE, EEE, Mech, ECE & CSE)

ENGINEERING WORKSHOP

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

At the end of the Engineering Work Shop:

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

MAPPING WITH COs & POs:

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

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

1) TRADES FOR EXERCISES:

A] Carpentry

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

B] Fitting

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

C] House Wiring

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

D] Tin Smithy

1) Rectangular Tray
2) Square Box without lid
3) Open Scoop

4) Funnel

E] Welding

1) Single V butt joint
2) Lap joint
3) Double V butt joint
4) T fillet joint

F] Soldering

1) Soldering & Disordering Practice
2) Series Circuit
3) Parallel Circuit

2) TRADES FOR DEMONSTRATION:

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

REFERENCE BOOKS:

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

IT WORKSHOP

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

By the end of module students will be expected to demonstrate

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

MAPPING WITH COs & POs:

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

PC HARDWARE

Exercise 1 - Identify the peripherals of a computer, components in a CPU and its functions.

Exercise 2 - Every student should disassemble and assemble the PC back to working condition.

Exercise 3 - Every student should individually install MS windows on the personal computer and also install Linux as dual boot with both Windows and

OFFICE TOOLS

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

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

SPREAD SHEET

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

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

PRESENTATION

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

REFERENCES:

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

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(A0006192) COMMUNICATIVE ENGLISH- II

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The course Communicative English - II is an extension of Communicative English - I. This will provide inputs in business vocabulary to introduce Communicative style in writing and speaking to expose students to professional scenario. This will led students to write letters in professional contexts. Communicative English -II enhances the students' communication skills in terms of LSRW Skills.

COURSE OUTCOMES:

- Develop communicative competence by enunciating words and learn Language games.
- Build the habit of reading skills and enhance styles of writing.
- Interpret different accents and modulations through active listening and improvisation of writing skills.
- Write clear and coherent passages.
- Improve the ability to speak effectively in English in real life situations and understanding of Team Dynamics.

MAPPING WITH COs & POs:

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

UNIT-1

a) Speaking - News Paper Reading - Narrating a Story/ Event
b) Vocabulary Development: Root words-Homonyms-Homophones-Wordlists - Quizzes - Language Games – Puzzles

UNIT-2

a) Reading Comprehension-Life is a Pizza by Richard Templar from Rules of Life - Vocabulary on Eateries, Food & Travel
b) Business Writing - Memorandums - Letters - Style & Formats - E-mail Writing - Practice

UNIT-3

a) Listening & Speaking - TED Talks - Listening Comprehension- Practice - Tests
b) Writing - Proposals - Technical Paper Writing- Practice – Movie Analysis

UNIT-4

a) Writing - Gadget Reviews - Technical Jargon - Resume Writing - Practice
b) Précis Writing - Techniques of Writing the Précis- Sample Analysis-Practice.

UNIT-5

a) Speaking - Seeking Information - Preferences - Likes & Dislikes - Cross - Cultural Communication
b) Satya Nadella: When empathy is good for business https://www.morningfuture.com - Team Dynamics Activity

UNIT-6

a) Listening & Writing - Movie/Short Film/Documentary Analysis
b) Info Graphics- Techniques - Practice from IELTS Videos

REFERENCE TEXT BOOKS:

1) Word Power Made Easy by Norman Lewis, Goyal Publications
2) Group Dynamics for Teams 3rd Ed. By Levi, Daniel. Sage Publications India Pvt.Ltd. New Delhi, 2011.
3) Business English Essentials by Henderson, Greta Lafollette & Price R Voiles 7th Edition. Glencoe/McGraw Hill.
4) On Writing Well by William Zinsser, Harper Perennial Press, 2016

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(A0007192) ORDINARY, PARTIAL DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- The effective mathematical tools for the solutions of differential equations that model physical processes.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering
- To familiarize the concepts in vector calculus like gradient, divergent and curl, as well as, divergent theorems.

COURSE OUTCOMES:

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

- Obtain the knowledge of first and higher order differential equations and its use in solving Circuit analysis, heat transfer problems in engineering.
- Analyze solving higher order linear differential equations with variable coefficients and its applications.
- Understand about formation and solution of partial differential equations and importance in thermodynamics, continuum mechanics and fluid mechanics.
- Understand about vector differentiation and its applications in Electromagnetic theory.
- Apply the concept of vector integration to solve many problems in field theory, Electromagnetic theory and transmission lines.

MAPPING WITH COs & POs:

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

UNIT-1

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

UNIT-2

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

UNIT-3

Higher Order linear Differential Equations with variable coefficients: Cauchy's and Legendre's linear Differential equations, simultaneous linear differential equations with constant coefficients.

UNIT-4

Partial Differential Equations of First order:

First order partial differential equations, Formation of partial differential equations, solutions of first order linear and non – linear Partial differential equations, Method of separation of variables.

UNIT-5

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

UNIT-6

Vector integration: Line integral - Potential function – Area, Surface and volume integrals. Vector integral theorems: Green's theorem (without proof) – Stoke's theorem (without proof) and Gauss Divergence Theorem (without proof); Verification of Green's, Stoke's and Gauss Theorems.

TEXT BOOKS/REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4) T.K.V. Iyengar, B. Krishna Gandhi and Others, Mathematical Methods, S. Chand & Company.
5) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.
6) S.R.K. Iyengar and R.K. Jain, Advanced Engineering Mathematics, Narosa publishing.
7) Ian Sneddon, Elements of Partial Differential equations, McGraw Hill.

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(A0005191) MODERN ENGINEERING CHEMISTRY

(For Branches: EEE, ECE & CSE)

COURSE OBJECTIVES:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To train the concepts of molecular structures and bonding
- To introduce the basic principles of spectroscopy and Supra molecules.

COURSE OUTCOMES:

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

- Concept of Ψ and Ψ^2 (L2)
- Compare the materials of construction for different types of batteries
- Explain the preparation, properties, and applications of thermoplastics, thermosetting & elastomers (L2)
- Understanding the principles of UV-Visible, IR and HPLC (L2)
- Applications of Supramolecular devices (L3)

MAPPING WITH COS & POS:

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

UNIT-1

Molecular Structure and Bonding:

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – energy level diagrams of O_2, Calculation of bond order - Band theory of solids – Crystal field theory and its salient features – band diagrams for conductors, semiconductors and insulators, role of doping on band structures.

UNIT-2

Electrochemistry and Applications:

Types of Conductance – Conductance, Specific conductance, Equivalent Conductance and molar conductance. Determination of equivalent conductance by Wheatstone bridge method. Numerical Problems on conductance. Electrodes – concepts, reference electrodes (Standard hydrogen electrode and Calomel electrode) Nernst equation, cell potential calculations, concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications.

Primary cells – Daniell cell, Fuel cells- hydrogen-oxygen and their working. Secondary cells – lithium ion batteries.

UNIT-3

Polymer Technology:

Polymers: Classification of polymers, functionality, chain growth and step growth polymerization, Copolymerization with specific examples and mechanisms of additional polymerization.

Plastics - Thermoplastics and Thermosets, Preparation, properties and applications of – Bakelite, urea- formaldehyde, Nylon-6:6, Nylon 6, Nylon 11 and polyethylene.

Rubbers: Natural Processing of Rubber, Vulcanization, preparation, properties and uses of Buna-S, Buna-N, Chloroprene.

UNIT-4

Advanced Engineering Material

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties and its Applications, Reasons for failure of the refractory materials

Nanoparticles: Introduction, preparation methods – Sol-gel method, Chemical reduction method –properties and applications in electronics.

UNIT-5

Fundamental aspects of Instrumental Methods

Electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law. UV-Visible and IR.

Spectroscopies: Principle and Instrumentation and its applications. Chromatography: Principle and methods of Thin Layer Chromatography, separation of liquid mixtures of High Performance Liquid Chromatography (HPLC)

UNIT-6

Molecular Machines and Molecular Switches:

Concepts and terms of supra molecular chemistry, complementarity, Basic Lock and Key principle, examples of Supramolecules, Molecular recognition- cation binding, anion binding.

Applications of Supramolecular Devices- Ionic devices, Electronic devices, switching devices.

TEXT BOOKS:

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

REFERENCE BOOKS*:*

1) K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e McGraw Hill Education (India) Pvt Ltd, New Delhi 2016
2) J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3) Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4) K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry Pearson India Education Services Pvt. Ltd
5) J.M.Lehn, Supra Molecular Chemistry, VCH Publications

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(A0202192) FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS

COURSE OBJECTIVES:

- To understand construction details, operation principle of semi-conductor devices
- Evolution of different diodes based on doping levels.
- The basic concepts for Electrical Engineering& Electronics Engineering.
- The basic analysis of circuits, which includes single-phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

COURSE OUTCOMES:

- Students are capable of identifying a particular device for specific applications
- Students are able to understand that all the devices are basically two state devices
- Students are able to understand rectifiers, filters and regulators
- Distinguish between AC Circuits and DC Circuits
- Acquires the concept of Resonance
- Thorough in basics of magnetic circuits and analysis

MAPPING OF COs & POs:

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

UNIT I DC CIRCUITS

Basic electrical terms: Charge-Voltage- Current- Power- Energy- Work done

Basic elements: Resistor- inductor-capacitor-ideal voltage source-practical voltage source-ideal current source-practical current source-Energy stored in inductor and capacitor

Introduction of Circuit Concept – R-L-C parameters – Types of Voltage and Current sources – Source transformation – Voltage-Current relationship for passive elements – Kirchhoff's laws – Network Reduction Techniques – Series, Parallel, Series-Parallel, Star-to-Delta or Delta-to-Star transformation, Nodal Analysis, Mesh Analysis, Super Node and Super Mesh Analysis -Problems

UNIT II AC CIRCUITS

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-R.M.S. and Average values and form factor of different periodic wave forms, Steady state analysis of R, L and C - series, parallel and series parallel combinations with sinusoidal excitation – Problems

UNIT III MAGNETIC CIRCUITS

Flux-reluctance-permeance – mmf – reluctivity-comparision between electrical circuit and magnetic circuit-Faraday's Laws of electromagnetic induction – Concept of self and mutual inductances – dot convention – coefficient of coupling – Composite Magnetic Circuits – Analysis of Series and Parallel Magnetic Circuits

RESONANCE

Resonance – Series, Parallel circuits, Concept of Bandwidth and Q-factor

UNIT IV SEMICONDUCTOR DIODE CHARACTERISTICS

Review of PN Junction Diode - V-I characteristics of PN diode, Zener diode characteristics, Principle and operation of Schottky Barrier Diode, SCR, DIAC, TRIAC, Avalanche photo diode, LED and Tunnel Diode with the help of energy band diagrams.

UNIT V BIPOLAR JUNCTION TRANSISTORS (BJT) AND JUNCTION FIELD EFFECT TRANSISTORS (JFET)

Study of operation of BJT, Detailed study of currents in a transistor, Input and Output characteristics of transistor in CB, CE, and CC configurations, Relation between Alpha, Beta and Gamma, Construction, operation and transfer and output characteristics, Pinch-Off voltage, construction of MOSFET and its characteristics (Enhancement and depletion mode), Comparison of Transistors (BJT, FET, and MOSFET) - UJT

UNIT VI RECTIFIERS, FILTERS AND REGULATORS

PN Junction as a Rectifier, Half wave rectifier, ripple factor, Efficiency, regulation and Transformer utilization factor (TUF). Full wave rectifier, Bridge rectifier **Filters:** Inductor filter, Capacitor filter, L-Section filter, Π- Section filter, comparison of various filter circuits, Simple circuit of a regulator using Zener diode.

TEXT BOOKS:

1) Electronic Devices and Circuits-2nd Edition-J.Millman, C.C.Halkias-Tata McGraw Hill- 2007.
2) Electronic Devices and Circuits-9th Edition– R.L. Boylestad and Louis Nashelsky-Pearson-2006.
3) Electronic Devices and Circuits-5th Edition- David A. Bell-Oxford University Press-2008.
4) Circuits, Networks-Analysis & Synthesis-4thEdition – Sudhakar and Shymmohan, TMH Publications –2007.
5) Circuit Theory (Analysis & Synthesis) –6th Edition- A.Chakrabarthi,-Dhanpat Rai & Co-2014

REFERENCES:

1) Electronic Devices and Circuits – 6th Edition- T.F. Bogart Jr., J.S.Beasley and G.Rico-Pearson Education -2004.
2) Principles of Electronic Circuits-2nd Edition– S.G.Burns and P.R.Bond, Galgotia Publications-1998.
3) Electronic Devices and Circuits -2nd Edition– Dr. K. Lal Kishore-B.S. Publications-2005.
4) Electric Circuits – 4th Edition- J. Edminister & M. Nahvi, - Schaum's Outlines, Tata Mc Graw-Hill Publishing Company Ltd-2007.
5) Engineering Circuit Analysis – 8th Edition- William Hayt and Jack E. Kemmerly-Mc Graw-Hill Companies-2017.
6) Network Analysis –3rd Edition-M.E Van Valkenberg- Prentice Hall India Learning Private Limited-1980.

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(A0502192) PROGRAMMING FOR PROBLEM SOLVING - II

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

At the end of this course, the student would be able to

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

MAPPING WITH Cos & POs:

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

UNIT-1

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

UNIT-2

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

UNIT-3

INTRODUCTION TO DATA STRUCTURES: Classification of data structures, dynamic memory allocation functions in C language. **Stacks:** Definition, Various representation methods, operations on stacks and their implementation in C language, applications of stacks.

UNIT-4

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

UNIT-5

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

UNIT-6

SEARCHING AND SORTING TECHNIQUES: Searching Techniques - Linear search and Binary Search Techniques. Sorting techniques - Bubble Sort, Selection Sort, Insertion

Sort. Implementation of all the above mentioned techniques in C language and trace them by giving different test data.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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(A0091191) ENGINEERING CHEMISTRY LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVE:

- Verify the fundamental concepts with experiments

COURSE OUTCOMES:

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

- Learning the analytical skills while doing the experiments (L3)
- Learning the quality of water and its significance (L2)
- Importance of the Conductometric titrations while determine the strength of weak acids a coloured solution (L3)
- Analyse the IR and UV-Visible Spectra of some organic compounds (L3)

Mapping with COs & POs:

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

LIST OF EXPERIMENTS:

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

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3 1.5

(A0593192) PROGRAMMING FOR PROBLEM SOLVING – II LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

At the end of this course, the student would be able to

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

MAPPING WITH Cos & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUREMENTS:

- Intel based desktop PC with ANSI C Compiler and Supporting Editors

Exercise-1

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

Exercise-2

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

Exercise-3

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

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

Exercise-4

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

Exercise-5

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

Exercise-6

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

a) Push

b) Pop
c) Display

Exercise-7

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

a) Insert
b) Delete
c) Display

Exercise-8

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

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

Exercise-9

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

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

Exercise-10

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

a) Linear Search
b) Binary Search

REFERENCE BOOKS:

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

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3 1.5

(A0092191) DIGITAL ENGLISH LANGUAGE LAB

(For Branches: CE, EEE, Mech, ECE & CSE)

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

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- Social interactions, greetings, self-introductions and group talk
- Improving standard pronunciation patterns and neutralize the mother tongue impact
- Developing communication through listening, reading, speaking and writing activities
- Enhancing vocabulary and grammar to develop professional language
- Improving life skills through GD and role plays practices

MAPPING WITH COs & POs

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

Digital English Language Lab consists of two parts:

1) CALL (Lab): Computer Assisted Language Learning
2) ICS (Lab): Interactivity Communication Skills

Exercise-1

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

Exercise-2

Diphthongs - Consonants - Phonetic Transcription - CALL Lab - Just A Minute (JAM) - ICS Lab

Exercise-3

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

Exercise-4

Vocabulary Building - Synonyms & Antonyms - Analogy - Testing Exercises - CALL Lab - Narration of a Story/Event/ Describing an Object - ICS Lab

Exercise-5

Situational Dialogues - CALL Lab - Role Play - ICS Lab

Exercise-6

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

Course Outcomes:

Student will able to learn:

- ❖ Will understand the spoken skills from CALL and ICS
- ❖ Will know the variations in accent of native and non-native speakers of English and achieve accent neutralization
- ❖ Will develop the reading & listening comprehension skills

PRESCRIBED SOFTWARE:

- K-VAN Solutions (licensed software)
  - ➢ Advance Communication Skills Lab
  - ➢ English Language Communication Skills Lab
- Cambridge Advanced Learners' English Dictionary with CD
- IELTS Academic Preparation and Practice with CD

BOOKS SUGGESTED FOR DELL: (CENTRAL LIBRARY)

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

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech, I-Sem (EEE)

L	T	C
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(A0012193) TRANSFORMATION TECHNIQUES AND COMPLEX VARIABLES

(For Branches: EEE & ECE)

COURSE OBJECTIVES:

- To familiarize the transformation techniques and complex variables.
- To equip the students to solve various application problems in Signals and Systems, Control systems, Network analysis and Digital signal processing etc.,

COURSE OUTCOMES:

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

- Understand the concept of Laplace and Inverse Laplace transformation and solving ODEs using Laplace transformation technique. Analyze applications of Laplace transforms in control system engineering and Signals and system engineering
- Determine the process of expanding periodic functions into Fourier series and non-periodic functions into Fourier transform its use in Electrical circuit analysis and signal processing
- Obtain the knowledge of Z – Transforms and its applications in digital electronics, control systems, signal processing & discrete systems
- To familiarize the complex variables and to analyze the importance of Caychy – Riemann equations in engineering
- Identify Residue theorem to solve many improper integrals and its use in control theory and electro-magnetic engineering.

MAPPING OF COs & POs

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

UNIT-1

Laplace transform of standard functions – Inverse Transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta (Unit Impulse) function – Initial and Final value theorems – Convolution theorem.

Laplace transform of Periodic function. Application of Laplace transforms to solve ODEs of first and second order.

UNIT-2

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

UNIT-3

Fourier integral theorem (statement only) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Parseval's identity for Fourier transforms.

UNIT-4

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

UNIT-5

Complex Variables: Continuity – Differentiability – Analyticity – Cauchy – Riemann equations in Cartesian and polar coordinates. Milne – Thompson method.

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

UNIT-6

Complex Series: Taylors series and Laurent series - Singular point – Isolated singular point – pole of order m – Removable – Essential singularity. Residue – Evaluation of residue – Cauchy's Residue theorem – Conformal Mapping – Bi – linear transformation.

TEXTBOOKS/REFERENCES:

1) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
2) J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
4) B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6) T.K.V. Iyengar, B. Krishna Gandhi and Others,A Text Book of Engineering Mathematics – III, S. Chand & Company.
7) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.
8) T.K.V. Iyengar, B. Krishna Gandhi and Others, A Text Book of Engineering Mathematics, Vol-1,S. Chand&Company

II B.Tech, I-Sem (EEE) L T C
2 1 3

(A0302193) FLUID MECHANICS AND HYDRAULIC MACHINERY

(For branches EEE & Mech)

COURSE OBJECTIVES:

- To give insight knowledge on fluid statics and fluid dynamics.
- To teach different types of fluid flow, and boundary layer phenomena.
- To teach operation and working principles of fluid machinery.

COURSE OUTCOMES:

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

- Apply conservation laws to fluid flow problems in engineering applications
- Compute drag and lift coefficients using the theory of boundary layer flows.
- Analyze and design free surface and pipe flows
- Design the working proportions of hydraulic machines

MAPPING OF Cos & POs:

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

UNIT-1

Fluid Statics: Dimensions and units: fluid properties, atmospheric pressure, gauge pressure and vacuum pressure –measurement of pressure- Piezometer, U-tube and differential manometers. Hydrostatic force on a plane area (Horizontal and vertical position), introduction to Buoyancy.

UNIT-2

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

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

UNIT-3

Closed conduit flow: Laminar and turbulent flow through pipes: Reynolds experiment significance of Reynolds's number, formulae for laminar flow through circular pipes, Turbulent flow-Darcy Weisbach equation, chezy's formula, friction factor - 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 (Only derivations).

UNIT-4

Boundary Layer Flow: Introduction, Definitions, Drag force on a flat plate due to Boundary layer, Turbulent Boundary layer on a flat plate, Analysis of Turbulent Boundary layer, Separation of Boundary layer.

UNIT-5

Basics of Hydraulic 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.

UNIT-6

Hydraulic Turbines : Classification of turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory-functions and efficiency, Unit and specific quantities, characteristic curves.

Hydraulic Pumps: Working principle of Centrifugal and Reciprocating pump. (No-derivations and No-problems)

TEXT BOOKS

1) Fluid Mechanics and Hydraulic Machinery MODI and SETH, 14th Edition, Standard Book House, New Delhi 2002.
2) Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Lakshmi Publications, New Delhi, revised ninth edition,2010.
3) Introduction to Fluid Mechanics and Fluid Machines, S.K. Som and G. Biswas, Tata McGraw-Hill, revised second editions,2008.

REFERENCES:

1) Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2) Fluid Mechanics and Machinery by Jagadeesh lal.
3) Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4) Fluid Mechanics and Hydraulic Machines by R. K. Rajput, Lakshmi Publications.
5) Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons Inc. (Chapter 12 – Fluid Flow Measurements).

WEBSITES:

1) https://nptel.ac.in/courses/112/105/112105269/
2) https://nptel.ac.in/courses/112/105/112105171/
3) https://nptel.ac.in/courses/112/105/112105206/
4) https://nptel.ac.in/courses/112/105/112105183/
5) https://nptel.ac.in/courses/112/106/112106200/

II B.Tech, I-Sem (EEE) L T C
2 1 3

(A0401193) ANALOG ELECTRONICS AND OP-AMP CIRCUITS

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- To learn the basics of different Amplifiers, wave shaping circuits and multivibrators.
- To analyze the performance of amplifiers and wave shaping circuits.
- To understand working operation of various feedback amplifiers.
- To apply the knowledge of various electronic circuits.
- Design various types of multi vibrator and Time base generator circuits.
- Applications of various electronic amplifiers.

MAPPING OF COs & POs

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

UNIT-1

DIODE CLIPPING AND CLAMPING CIRCUITS: Introduction, Semiconductor Diode as a Switch, Clipping Circuits- Series, Shunt, Two-level Clippers. Clamping Circuits- Practical Clamping Circuit, Design of a Clamping Circuit, Effect of Diode Characteristics on the Clamping Voltage, Clamping Circuit Theorem.

UNIT-2

SINGLE STAGE AMPLIFIERS: Transistor as a Switch, Importance of Biasing, Operating Point, Load line (DC and AC), Types of Biasing: Fixed bias, Collector to Base, Voltage Divider bias, Thermal stability in CE configuration, Transistor as an amplifying device.

Classification of Amplifiers, Small signal equivalent model of BJT, Analysis of single stage transistor amplifier (CE, CB, and CC) using h-parameters- Deriving equations for Input Impedance, Output Impedance, Voltage Gain and Current Gain.

UNIT-3

POWER AMPLIFIERS

Introduction, Classification of Power Amplifiers, Class A Amplifiers (Directly Coupled and Transformer Coupled), Second - Harmonic Distortion, Higher - Order Harmonic Generations, Class B Amplifier (Push Pull), Elimination of Cross over distortion.

UNIT-4

FEEDBACK AMPLIFIERS: Concepts of Feedback, Classification of Feedback Amplifiers, Transfer Gain with Feedback, General Characteristics of Negative-Feedback Amplifiers, Effect of Feedback on Amplifier characteristics, Analysis of a feedback Amplifiers - Voltage – Series, Current-Series, Current-shunt and Voltage – shunt.

OSCILLATORS: Conditions for oscillations, Phase - shift Oscillator, Wien Bridge Oscillator, L-C Oscillators (Hartley and Colpitts).

UNIT-5

OPERATIONAL AMPLIFIER: Basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, modes of operation-

inverting, non-inverting, differential, Comparator, Schmitt trigger, Astable and Monostable Multi vibrators

UNIT-6

SPECIAL PURPOSE INTEGRATED CIRCUITS: Introduction to 555 timer, functional diagram, Monostable and Astable operations, Schmitt Trigger and applications, Functional block diagram, working and applications of Phase Locked Loop(PLL).

TEXT BOOKS:

1) R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", 6th edition, Pearson Prentice Hall, 2009.
2) David A. Bell, "Solid State Pulse circuits", 1st edition, PHI, 1992.
3) D. Roy Chowdhury, "Linear Integrated Circuits", 2nd edition, New Age International (p) Ltd, 2003.

REFERENCE BOOKS:

1) J. Millman, C. C. Halkias, and Satyabratha Jit, "Electronic Devices and Circuits", 1st edition, Tata McGraw Hill, 1976.
2) J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", 5th edition, TATA Mc-Graw-Hill, 1984.
3) R.S. Setha, "Applied Electronics", S. Chand and Company Ltd, 2008.
4) https://nptel.ac.in/courses/117/107/117107094/

II B.Tech, I-Sem (EEE)

L	T	C
2	1	3

(A0205193) FIELD THEORY

COURSE OBJECTIVES:

- The objective of this course is to introduce the concepts of electric field
- To introduce magnetic fields concepts which will be utilized in the development of the theory for power transmission lines and electrical machines?

COURSE OUTCOMES:

- To apply knowledge of basic mathematics and physics for the determination of electric and magnetic quantities.
- Application of electrostatic and magneto static theorems to determine electric field intensity and magnetic field intensity
- To determine the self and mutual inductance of simple practical current carrying systems
- To solve the problems related to electromagnetic field using dealt theorems
- To understand time varying electromagnetic fields as governed by the maxwell's equations
- To analyze the behavior of the conductors using ohms law, inductors using Faraday's law and capacitors using dielectric principles.

MAPPING OF COs & POs

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

UNIT-1

Electrostatics-I

Coulomb's law and electrical field intensity: Coulomb's law, Field due to different charge distributions.

Electric flux density, Gauss's law and divergence: Concept of electric flux density, Gauss's law and its applications, Maxwell's first eqn. and divergence theorem for electric flux density.

Electrical potential & Dipole: Energy expanded in moving a point charge in electrical field, Line integral, Definition of potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, Electric Dipole, potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field.

UNIT-2

Electrostatics-II

Conductors, dielectrics and capacitance: Definition of currents and current density, Continuity equation, Behavior of conductors inside an electric field, Dielectric materials, Characteristics, Dielectric polarization, Boundary conditions, Energy density in electrostatic field, Capacitance of a parallel plate capacitor, Coaxial cable and spherical capacitors. Poisson's and Laplace equation, Examples of solution of Laplace and Poisson's equations

UNIT-3

Magneto statics

Biot–savart Law and its applications: Magnetic field intensity – Biot–savart Law - Magnetic field due to straight conductors, circular loop and solenoid current Carrying wire – Magnetic flux density (B) – B in free space, Maxwell's second Equation.

Ampere's circuital law and its applications: 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, Curl (H)=Jc, Field due to a circular loop, rectangular and square loops.

UNIT-4

Magnetic forces: Lorentz Law of force ,Force on a moving charge, Force on a differential current element, Force on a straight and a long current carrying conductor in a magnetic field, Force between two straight long and parallel current carrying conductors ,Force and torque on a close circuit.

UNIT-5

Magnetic potential and inductance: 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, Neuman'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.

UNIT-6

Electro Dynamic Fields: Faraday's laws and its integral and point forms, induced emf – Transformer and motional EMF –Maxwell's equations (differential and integral forms) – Displacement current – Relation between field theory and circuit theory - Modification of Maxwell's equations for time varying fields, Poynting Theorem and poynting vector

TEXT BOOKS:

1) Sadiku, Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford University Press, 2015.
2) William.H.Hayt, "Engineering Electromagnetics", 8th Edition, Mc Graw Hill, 2012.
3) J.D. Kraus, "Electromagnetics", 5th Edition, Mc Graw Hill Inc, 1999.

REFERENCE BOOKS:

1) Mahmood Nahvi, Joseph Edminister, "Schaums Outline of Theory and Problems of Electromagnetics" 5th edition, McGraw-Hill Education, 2018.
2) K. D. Prasad, "Antenna and Wave Propagation", Galgotia puplication, 2007.
3) K.A. Gangadhar and P.M. Ramanathan, "Electomagnetic Field Theory", 8th Reprint, Khanna Publications, 2015.
4) https://nptel.ac.in/courses/108/106/108106073/

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech, I-Sem (EEE)

L	T	C
2	1	3

(A0206193) ELECTRICAL CIRCUIT ANALYSIS

COURSE OBJECTIVES

- To impart strong foundation in Network analysis
- To introduce three phase circuit and analysis
- To give strong foundation in Electrical Circuits

COURSE OUTCOMES

- Analyses & design a circuit with the help of theorems.
- Learn concepts of network graph theory.
- Learn various techniques to find electrical parameters for a given electrical circuit.
- Distinguish between AC Circuits and DC Circuits.
- Find Transient response of series and parallel RL,RC & RLC Circuits.
- Learn concept of network parameters.

MAPPING OF COs & POs

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

UNIT-1 NETWORK THEOREMS

Network theorems: (Without proof): Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Compensation, Millman's, and Tellegen's theorems for dc and ac excitations

UNIT-2 GRAPH THEORY

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

UNIT-3 THREE PHASE CIRCUITS

Three phase circuits : Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – Application of Millman's theorem to unbalanced circuits - Measurement of 3 phase power, active power and reactive power.

UNIT-4 DC TRANSIENT ANALYSIS

Transient response of RL, RC, RLC circuits (Series and Parallel combinations) for D.C excitation - Initial conditions –Classical method and Laplace transform methods of solutions – Response of RL, RC, RLC for step, ramp, pulse and impulse excitations using Laplace transform methods.

UNIT-5 AC TRANSIENT ANALYSIS

Transient response of RL, RC, RLC circuits (Series and Parallel combinations) for sinusoidal excitations - Initial conditions –Classical method and Laplace transform methods of solutions.

UNIT-6 TWO PORT NETWORKS

Two Port network parameters – Z, Y, (ABCD) Transmission and Hybrid parameters for Resistive Networks and their relations

TEXT BOOKS:

1) Abhijit Chakrabarthi, "Circuit Theory Analysis & Synthesis", Dhanpat Rai & Co. 2008.
2) K. S. Suresh Kumar, "Electric circuits and Network", 1st edition, Pearson education, 2009.

3) William Hayt and Jack E. Kemmerly, "Engineering Circuit Analysis", 8th edition McGraw-Hill Education, 2011.

REFERENCES BOOKS:

1) Mahmood Nahvi and Joseph A. Edminister, "Schaum's Outlines Electric Circuits", 4th edition, Tata McGraw Hill companies, Inc., 2007.
2) Sudhakar and Shymmohan, "Network Analysis", 4th edition, TMH Publications, 2007.
3) M.E Van Valkenberg, "Network Analysis", 3rd edition, Pearson Education, 2006.
4) https://nptel.ac.in/courses/108/104/108104139/

II B.Tech, I-Sem (EEE) L T C
2 0 2

(A0010193) BIOLOGY FOR ENGINEERS

(Life Sciences)

(For branches: CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To familiarize about biological components and their applications
- To train the students on the principles and Mechanisms in Biological Chemistry
- To train the concepts of molecular structures of Biomolecules
- To introduce the basic principles of Cell Structures and Functions
- To apply the concepts in the development of biosensors for mankind.

COURSE OUTCOMES:

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

- Explain concept and function of cell and cell organelles
- Develop knowledge about various physiological processes in biological systems
- Explain about biomolecules, their structure and function and their role in living organisms. How biomolecules are useful in industry.
- Understanding about human physiology
- Identify and describe the functions of the skeletal system

MAPPING OF COs & POs:

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

UNIT-1

Cell Structure and Function - Cell theory, Ultra structure of eukaryotic cell (Cell wall, Cell membrane, Golgi complex, Endoplasmic Reticulum, Peroxisome, Lysosomes), Semi-autonomous cell Organelles (Mitochondria & Chloroplast) (5 periods)

Learning outcomes:

1) Understand the structure and importance of the cell.
2) Explain the importance of eukaryotic cell.
3) Explain the functions of cell organelles.

UNIT-2

Human Physiology – Nutrition (Functions of micro & macro nutrients and their role), Respiration (Definition, Types, Respiration in humans), Digestion (Process and digestive organs in humans), Excretion (Definition, Urinary system in humans). (6 Periods)

Learning outcomes:

1) Understand the metabolism in living organism.
2) Explain about the importance of human physiological process.
3) Identify the nutritional values in human body.

UNIT-3

Biomolecules - Proteins (Denaturation of proteins), Nucleic acids (Mechanism of Replication & Transcription), Vitamins (Classification & functions of vitamins in bio-systems). (5 Periods)

Learning outcomes:

1) Describe the denaturation of proteins.
2) Illustrate replication of nucleic acids.
3) Identify the importance of Vitamins in human body.

UNIT-4

Biomaterials - Definition of biomaterials, Requirements of biomaterials, Classification of biomaterials, Physical and Mechanical properties of bio-materials, Comparison of properties of some common biomaterials. (5 Periods)

Learning outcomes

1) Understand the role of biomaterials for humans.
2) Understand the properties of biomaterials for organ substitution.

UNIT-5

Skeletal System-Types of bones, Structure and composition of bone, artificial bone replacements with soft engineering materials. (6 Periods)

Learning outcomes

1) Understand bone structure and composition
2) Able to develop knowledge about bone replacement.

UNIT-6

Applications of Biology- Stem Cells (Sources, Types and its Uses) Cancer Therapy, Basics of bio-sensors and bio-chips for bio-engineering. (5 Periods)

Learning outcomes

1) Understand the role of stem cells in biology.
2) Develop new type of biosensors, biochips etc.

TEXT BOOKS

1) Nelson, D. L. and Cox, M.M. (2008).Lehninger, Principles of Biochemistry, 5th Edition, W.H.Freeman and Company, N.Y., USA.
2) Ross & Wilson, Anatomy and Physiology, Churchill Livigstone publications (2014).

REFERENCE BOOKS

1) Voet, D. and Voet, J.G. (2004). Biochemistry, 3rd Edition, John Wiley & Sons, Inc. USA.
2) Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition, John Wiley & Sons. Inc.
3) De Robertis, E. D. P. and De Robertis R. E. 2009. Cell and Molecular Biology, 8th edition. Lippincott Williams and Wilkins, Philadelphia.
4) Cooper G. M. Hausman R. E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington D. C.; Sinnauer Academic Press.
5) L. Hench & E.C. Ethridge, Biomaterials – An Interfacial approach, Academic Press, 1982.

II B.Tech, I-Sem (EEE)

L	T	C
1	2	0.5

(A0011193) APTITUDE, ARITHMETIC, REASONING AND COMPREHENSION

(Skill Development Course)

(For branches CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

- Understand number system which helps to become well trained for recruitment drives.
- Analyse permutations and combinations concept.
- Obtain the knowledge of coding and decoding concept.
- Understand the topics related to clock and probability.
- Identify the topics related to Venn diagrams, reasoning and Non-verbal reasoning.

MAPPING OF COs & POs

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

UNIT-1

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

UNIT-2

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

UNIT-3

Permutations & Combinations and Probability Data Interpretation & Data Sufficiency.

UNIT-4

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

UNIT-5

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

UNIT-6

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

REFERENCES:

1) R.S.Agarwal. Quantitative Techniques. S.Chand Series.
2) Shankuntala Devi. Techniques of Reasoning. S.Chand Series.
3) https://www.fresherslive.com/online-test/verbal-ability-test/questions-and- answers
4) https://www.fresherslive.com/online-questions/verbal-ability-test/arithmetic-Reasoning

II B.Tech, I-Sem (EEE) P C
3 1.5

(A0491193) ELECTRONIC DEVICES AND CIRCUITS LAB

(For Branches: EEE & ECE)

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- Students able to learn electrical model for various semiconductor devices.
- Students able to learn electrical model for FET devices.
- Realize simple Rectifier without filters and with filters.
- Analyze and design the RC circuits.
- Design the circuits for generating desired wave shapes (Clippers and Clampers)

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS:

1) PN Junction diode characteristics.
2) Zener diode characteristics and Zener as a Regulator.
3) Transistor CB characteristics (Input and Output).
4) Transistor CE characteristics (Input and Output).
5) Rectifier without filters (Full wave &Half wave).
6) Rectifier with filters (Full wave &Half wave).
7) FET characteristics.
8) MOSFET characteristics.
9) SCR characteristics.
10) UJT characteristics.
11) Linear wave shaping
12) Non Linear Wave Shaping – Clippers
13) Non Linear Wave Shaping – Clampers

II B.Tech, I-Sem (EEE) P C
3 1.5

(A0391193) FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

(For Branches EEE & ME)

COURSE OBJECTIVES:

- This course "Fluid Mechanics and Hydraulic Machines" lab imparts intensive and extensive practical knowledge of the lab so that students can understand the importance of concepts of "Fluid Mechanics and Hydraulic Machines" in the field of engineering. The student should able to develop theoretical / practical capabilities so that they can characterize, transform, use and apply in engineering from the knowledge gained in solving related engineering problem.

COURSE OUTCOMES:

- Calibrate flow measuring devices used in pipes, channels and tanks
- Determine fluid flow properties
- Characterize laminar and turbulent flows
- Determine the performance characteristics of various fluid machines like pumps, turbines etc.
- Establish the specific energy curve
- Determine Energy loss in Hydraulic jump

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS:

1) Verification of Bernoulli's Equation
2) Calibration of Mouthpiece/orifice
3) Calibration of Triangular/Rectangular Notch
4) Calibration of Venturi meter
5) Calibration of Orifice meter
6) Determination of Friction Factor for a given pipe line
7) Impact of Jet on Vanes
8) Performance Test on Pelton Wheel
9) Performance Test on Francis Turbine
10) Performance Test on Kaplan Turbine
11) Performance Test on Single Stage Centrifugal Pump
12) Performance Test on Reciprocating Pump

II B.Tech, I-Sem (EEE) P C
3 1.5

(A0292193) CIRCUIT THEORY AND SIMULATION LAB

COURSE OBJECTIVES:

- To understand basic concepts of electric circuits.
- To understand the various techniques that can be used to analyze electric circuits.
- To understand basic concepts of MATLAB tool.
- To understand the basic concept of electrical circuits.
- To understand the various techniques that can be used to analyze electric circuits using MATLAB tool.

COURSE OUTCOMES:

- Analyze response of series and parallel resonant circuits.
- Effect of parameter variation on electrical current and voltage.
- Analyze and Verification of network theorems.
- Measurement of three phase power by using two single phase watt meters.
- Evaluate steady state behavior of single port networks for DC and AC excitations.
- Finding of magnetic circuits parameters.

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS:

1) Experimental verification of Series and Parallel Resonance
2) Experimental verification of Thevenin's and Norton's Theorem
3) Experimental verification of Maximum Power Transfer and Reciprocity Theorem
4) Experimental Verification of Superposition & Millmann's Theorem
5) Experimental verification of Z & Y Parameters
6) Experimental verification of Hybrid & ABCD Parameters
7) Experimental verification of Measurement of Active Power for Star and Delta Connected Balanced & Unbalanced Loads

SIMULATION OF EXPERIMENTS USING MATLAB

1) Verification of Series and Parallel Resonance
2) Verification of Thevenin's and Norton's Theorem
3) Verification of Maximum Power Transfer and Reciprocity Theorem
4) Verification of Superposition & Millmann's Theorem
5) Verification of Hybrid & ABCD Parameters

II B.Tech, II-Sem (EEE) L T C
2 1 3

(A0503193) PYTHON PROGRAMMING

(For branches CE, Mech, EEE, ECE, CSE)

COURSE OBJECTIVES:

This course will enable students to

- Learn Syntax and Semantics of various Operators used in Python.
- Understand about Various Input, Output and Control flow statements of Python.
- Handle Strings and Files in Python.
- Understand Lists, Tuples in Python.
- Understand Sets, Dictionaries in Python.
- Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES:

The students should be able to

- Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
- Make use of flow control statements and Input / Output functions of Python.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists and Tuples.
- Apply the core data structures like Sets and Dictionaries in Python Programming.
- Demonstrate the use of functions, modules and Regular Expressions in Python.

MAPPING OF COs & POs

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

UNIT-1

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Overview on data types: Numbers, Strings, Lists, Set, Tuple and Dictionaries.

Operators in Python: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Shift Operators, Ternary operator, Membership Operators, Identity Operators, Expressions and order of evaluations. Illustrative examples on all the above operators.

UNIT-2

Input and Output statements: input() function, reading multiple values from the keyboard in a single line, print() function, 'sep' and 'end' attributes, Printing formatted string, replacement operator ({}). Illustrative examples on all the above topics.

Control flow statements: Conditional statements – if, if-else and if-elif-else statements. Iterative statements – for, while. Transfer statements – break, continue and pass. Illustrative examples on all the above topics.

UNIT-3

Strings: Introduction to strings, Defining and Accessing strings, **Operations on string** - String slicing, Mathematical Operators for String, Membership operators on string, Removing spaces from the string, Finding Substrings, Counting substring in the given String, Replacing a string with another string, Splitting of Strings, Joining of Strings, Changing case

of a String, Checking starting and ending part of the string, checking type of characters present in a string. Illustrative examples on all the above topics.

Files: Opening files, Text files and lines, Reading files, Searching through a file, Using try, except and open, Writing files, debugging.

UNIT-4

Lists: Creation of list objects, Accessing and traversing the elements of list. **Important functions of list** – len(), count(), index(), append(), insert(), extend(), remove(), pop(), reverse() and sort(). **Basic Operations on list:** Aliasing and Cloning of List objects, Mathematical Operators for list objects, Comparing list objects, Membership operators on list, Nested Lists, List Comprehensions. Illustrative examples on all the above topics.

Tuples: Creation of Tuple objects, Accessing elements of tuple, Mathematical operators for tuple, Important functions of Tuple – len(),count(),index(), sorted(), min(), max(), cmp().Tuple Packing and Unpacking. Illustrative examples on all the above topics.

UNIT-5

Sets: Creation of set objects, Accessing the elements of set. Important functions of set –add(), update(), copy(), pop(),remove(),discard(),clear(). Basic Operations on set **-** Mathematical Operators for set objects, Membership operators on list, Set Comprehensions. Illustrative examples on all the above topics.

Dictionaries: Creation of Dictionary objects, Accessing elements of dictionary, Basic operations on Dictionary - Updating the Dictionary, Deleting the elements from Dictionary. Important functions of Dictionary – dict(), len(), clear(), get(), pop(), popitem(), keys(), values(), items(), copy(), setdefault(). Illustrative examples on all the above topics.

UNIT-6

Functions - Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables. Recursive functions, Illustrative examples on all the above topics**.**

Modules: Creating modules, **import** statement, from Import statement.

Regular Expressions: Character matching in regular expressions, Extracting data using regular expressions, combining searching and extracting, Escape character.

TEXT BOOKS:

1) Python for Everybody: Exploring Data Using Python 3, 2017 Dr. Charles R. Severance

REFERENCE BOOKS:

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

II B.Tech, II-Sem (EEE)

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(A0405194) DIGITAL ELECTRONICS

COURSE OBJECTIVES:

- Understand the different number system, its conversions and binary arithmetic.

COURSE OUTCOMES:

- Convert one number system to other number system, Classifications of BCD codes.
- Simplify the given logical function by using Boolean algebra, k-map and tabular methods.
- Understand the concepts of PLD's (ROM/PROM, PAL & PLA).
- Design and analyze combinational and sequential logic circuits.
- Optimize combinational and sequential logic circuits.
- This course introduces all varieties of linear and digital IC's. It also deals with Timers, PLL's, D-A and A-D converters.

MAPPING OF COs & POs

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

UNIT-1

NUMBER SYSTEMS, CODES AND BOOLEAN ALGEBRA: Philosophy of number systems – complement representation of Negative numbers, Binary arithmetic, Binary codes, Error Detecting &Error Correcting codes, Hamming codes. Fundamental postulates of Boolean algebra, Basic theorems and properties

UNIT-2

SWITCHING FUNCTIONS AND IT'S MINIMIZATION: Switching functions, Canonical and standard forms, Algebraic simplification Digital Logic Gates, properties of XOR gates, Universal Gates, Multilevel NAND/NOR realizations. K-map method, Prime Implicants, Don't care combinations, Minimal SOP and POS forms.

UNIT-3

COMBINATIONAL LOGIC DESIGN: Half adder, Full adder, Ripple carry adder, Carry look ahead generator, BCD adder, Half substractor, Full substractor, Encoder, Decoder, Multiplexer, De-Multiplexer, MUX realization of Switching functions, Parity bit generator, Code-converters, multiplier.

UNIT-4

PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC: Basic PLD's-ROM, PROM, PLA, PAL Realization of switching function using PLD's.

UNIT-5

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

UNIT-6

D-A & A- D CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications – Numerical problems.

TEXTBOOKS:

1) Morries Mano, "Digital Design" 4th edition, PHI.
2) Anand Kumar, "Switching Theory and Logic design", 3rd edition, PHI learning Pvt Ltd., 2016.
3) D. Roy Chowdhury, "Linear Integrated Circuits", 2nd edition, New Age International (p) Ltd, 2003.

REFERENCES:

1) Fletcher, "An Engineering Approach to Digital Design", Prentice-Hall, 2007.
2) Charles H. Roth, "Fundamentals of Logic Design", 7th edition, Cengage learning, 2013.
3) John M. Yarbrough, "Digital Logic Applications and Design", West Publishing Company, 1998.
4) Zvi Kohavi, "Switching & Finite Automata theory", 2nd edition, Tata McGraw-Hill, 1978.
5) Floyd, "Digital Fundamentals", 11th Edition, Pearson, 2015.
6) https://nptel.ac.in/courses/108/105/108105132/

II B.Tech, II-Sem (EEE) L T C
2 1 3

(A0208194) GENERATION AND DISTRIBUTION OF ELECTRIC POWER

COURSE OBJECTIVES:

- Power Systems-I is one of the important courses of the electrical discipline.
- This course helps to know different means of Electrical Generation, Distribution of power considering economical aspects.

COURSE OUTCOMES:

- To know the general system that involves how the electrical power is generated at source and consumed at load side.
- To know the concepts and phenomenon of Power Generation by some conventional sources.
- To know the importance and different parts involved in substations.
- To know the several economic aspects involved in generating stations.
- To know the different ways of distribution of electrical power after transmission from generating station.
- Understand different cost involved in generation of electric power and how the tariff is fixed for different types of loads and consumers.

MAPPING OF COs & POs

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

UNIT-1

ENERGY GENERATION WITH CONVENTIONAL SOURCES:

Thermal Power Stations (TPS): Line Diagram of TPS, description of various parts like Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimneys, electrostatic precipitator, Cooling Towers, Paths of air, coal, Flue gases.

Hydro Power Stations (HPS): Selection of site, Classification, Layout, description of Main Components.

UNIT-2

NUCLEAR POWER STATION (NPS):

Nuclear Fission, Chain reaction, Nuclear Fuels-Principle of operation of Nuclear reactor-its Parts, Radiation Hazards, Shielding and Safety Precautions-Types of nuclear reactors and brief description of PWR, BWR & FBR.

UNIT-3

SUBSTATIONS:

Classification of Substations - Air insulated substations (AIS)-indoor and outdoor substations. Bus bar arrangements in substations: simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

Gas insulated Substations (GIS): advantages, different types, single line diagram, bus bar, construction aspects, installation and maintenance of GIS. Comparison of AIS and GIS

UNIT-4

DISTRIBUTION SYSTEM:

Classification and comparison of AC & DC Distribution Systems - Comparison of Underground and over head Distribution System - Voltage drop calculations in DC distribution for following cases – Radial Distributor-fed one end, both ends (equal and unequal voltages), Ring main Distributor, and inter grid-Voltage drop calculations in AC distribution for following cases – p.f. refer to receiving end voltage and w.r.t load voltages.

UNIT-5

ECONOMIC ASPECTS OF POWER GENERATION:

Load Curve, Load duration Curves- Load, demand, Diversity, Capacity, Utilization and plant use factors-numerical problems.

UNIT-6

TARIFF METHODS:

Cost of generation & their division into fixed, semi fixed & running cost - Desirable characteristics of tariff method – tariff methods – flat rate, block-rate tariff, two part tariff, three part tariff & power factor tariff methods & numerical problems.

TEXT BOOKS:

1) M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A. Chakrabarthy, "A Text Book on Power System Engineering", Dhanpat Rai & Co Pvt. Ltd, 2008.
2) V. K. Mehata and Rohit Mehata, "Principles of power systems", Revised edition, S. Chand, 2005.
3) R.K Rajput, "Power Systems Engineering", 2nd edition revised, Laxmi Publishers, 2006.
4) C. L. Wadwa, "Electrical Power Systems", New Age International (P) Limited, 2009.

REFERENCES BOOKS:

1) M.V Deshpande, "Elements of Power station design", PHI learning Pvt Ltd., 2010.
2) B. R. Gupta, "Power System Analysis and Design", A. H. Wheeler Publishing Company Limited, 1998.
3) S.N Singh, "Electrical Power Generation, Transmission and distribution", 2nd edition, PHI learning Pvt Ltd., 2011.

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L	T	C
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(A0209194) CONTROL SYSTEMS

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- Analyze electromechanical systems by mathematical modeling.
- Determine Transient and Steady State behavior of systems using standard test signals.
- Analyze linear and non-linear systems for steady state errors, absolute stability and relative stability.
- Determine stability analysis in s-domain using RH criterion and Root Locus Techniques.
- Able to observe stability using the analysis of polar, nyquist and bode plots.
- Using state space analysis state models can be obtained.

MAPPING OF COs & POs

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

UNIT-1

INTRODUCTION: Concepts of control systems – Open loop and closed loop control systems and their differences, examples – Types of feedback control systems

Mathematical modeling of Electrical & Mechanical (translational & rotational) systems, differential equations- Electrical analogous (F-V,F-I) of mechanical system- use of Laplace transforms in control systems-Transfer function: concepts, features-Transfer functions of above systems

UNIT-2

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

UNIT-3

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

UNIT-4

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

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

UNIT-5

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

UNIT-6

POLAR AND NYQUIST PLOTS: Polar plots - Nyquist plots- Stability analysis

TEXT BOOKS:

1) J. Nagarath and M. Gopal, "Control System Engineering", New age international (P) limited, 2006.
2) B.C. Kuo, "Automatic control systems", 9th edition, John Wiley and son's, 2010.
3) Katsuhiko Ogata, "Modern control engineering", PHI, 2010.

REFERENCE BOOKS:

1) M. Gopal, "Control systems: Principles and Design", Tata McGraw-Hill Education Pvt Limited, 2002.
2) S. Palani, "Control Systems Engineering", 2nd edition, Tata McGraw-Hill Education Pvt Limited, 2010.
3) Norman S. Nise, "Control Systems Engineering", John Wiley, 2017.
4) https://nptel.ac.in/courses/107/106/107106081/

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L	T	C
2	1	3

(A0210194) ELECTRICAL MACHINES-I

COURSE OBJECTIVES:

- Electrical machines course is one of the important courses of the electrical discipline.
- In this course different types of DC generators and motors which are widely used in industry are covered and their performance aspects will be studied.

COURSE OUTCOMES:

- Understand the construction and working principle of operation of DC Generator.
- Analyze the effect of armature reaction and the process of commutation in DC generator and its improvement methods.
- Understand the characteristics of DC Generator and its specific applications. Analyze parallel operation of DC Generators.
- Understand the working of DC motor along with its characteristics and applications.
- Apply the theory for controlling the speed of all DC Motors and need of starters
- Test the performance DC motor and DC Generator.

MAPPING OF COs & POs

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

UNIT-1

D.C. GENERATORS – CONSTRUCTION & OPERATION: 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 – Problems

UNIT-2

ARMATURE REACTION IN D.C. GENERATOR: Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation.

UNIT-3

TYPES OF DC GENERATORS &LOAD CHARACTERISTICS: 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 – parallel operation of d.c series generators – use of equalizer bar and cross connection of field windings – load sharing.

UNIT-4

D.C. MOTORS: 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.

UNIT-5

SPEED CONTROL OF D.C. MOTORS: Speed control of d.c. Motors: Armature voltage and field flux control methods- Ward-Leonard system-Principle of 3 point and 4 point starters – protective devices

UNIT-6

TESTING OF D.C. MACHINES: Testing of d.c. machines: Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency Methods of Testing – direct, indirect and regenerative testing – brake test – Swinburne's test – Hopkinson's test – Field's test – Retardation test – separation of stray losses in a d.c. motor test.

TEXT BOOKS:

1) P.S. Bimbra, "Electrical Machinery", 7th edition, Khanna Publishers, 2011.
2) I.J. Nagrath & D.P. Kothari, "Electric Machines", 3rd edition, Tata Mc Graw – Hill Publishers, 2004.
3) J. B. Gupta, "Theory & performance of Electrical Machines", S. K. Kataria & Sons, 2009.

REFERENCE BOOKS:

1) E. Fritzgerald, C. Kingsley and S. Umans, "Electric Machinary", 7th edition, Mc Graw-Hill Companies, 2014.
2) A.E. Clayton and Hancock, "Performance and Design of D.C Machines", 3rd edition, BPB. Publishers, 2004.
3) L. Theraja, "A text book of Electrical Machines", Vol-II, S. Chand.
4) P. C. Sen, "Principles of Electric Machines and Power Electronics", 2nd edition, Wiley India Pvt. Limited, 2007.
5) https://nptel.ac.in/courses/108/105/108105017/

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II B.Tech, II-Sem (EEE) L T C
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(A0017194) INDIAN HERITAGE AND CULTURE

(Mandatory Learning Course-I)
(For Branches CE, EEE, Mech, ECE & CSE)

INTRODUCTION:

- Indian Heritage is an ancient facet pertaining to bygone ages. It reflects strong ethical culture and embodiment of nature in life style. It had its deep roots in great Indian epics and Upanishads. It has been transformed and strengthened by many kings and queens. It is received by erudite writers. The glory of Indian Heritage & culture have been ignored or distorted in wake of western culture. The present generation ought to know their indigenous culture and heritage.

COURSE OBJECTIVES:

- To enable the students to have an insight into and understanding of the great heritage and culture of India.
- To sensitize them towards preservation and progression of the same.

COURSE OUTCOMES:

- Equip themselves with knowledge about the heritage and culture of India.
- Apply the ancient wisdom to become successful professionals.

MAPPING OF COs & POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO1															
CO2															

UNIT-1

Origin of Indian Culture - Indus valley & Vedic Culture Evolution - Political unification of India under Mauryas and Guptas - Cultural achievements - Cultural conditions under the Sathavahanas - Contribution of Pallavas and Cholas to art and letters.

UNIT-2

Influence of Islam on Indian Culture - The Sufi, Bhakti and Vishnavite Movements - Cultural achievements of Vijayanagara rulers - Contribution of Shershah and Akbar to the evolution of administrative system in India - Cultural Developments under Mughals - Great Indian Monuments.

UNIT-3

Great Indian Epics - Ramayana and Mahabharata - Upanishads - Vedas - Pathanjali - Yoga - Principles of Jainism and Buddhism.

UNIT-4

Indian Literature - Rabindranath Tagore - Arundhathi Roy - RK.Narayan - Sri Sri - Gurajada -Jashuva - Western Impact on India - Introduction of Western Education - End of the Gurukulas educational system.

UNIT-5

Social and Cultural awakening and social reform movements - Raja Rama Mohan Roy - Dayananda Saraswathi -Theosophical Society - Ramakrishna Paramahamsa and Vivekananda - Iswara Chandra Vidyasagar and Kandukuri Veeresalingam - Emancipation of women and struggle against Caste.

UNIT-6

Mahatma Gandhi - Non-violence and Satyagraha - Great leaders of Freedom struggle - Post Independent Era.

TEXT BOOK

1) Madanlal Malpani & Shamsunder Malpani (2016), ***Indian Heritage and Culture,*** New Delhi: Kalyani Publishers.

REFERENCE BOOKS

1) Romila Thapar (2018) , Indian Cultures as Heritage: Contemporary Pasts, India.
2) Anurag Mathur (2017), Indian Culture & Heritage , Create space independent publishing Platform, 2017.
3) P.R.Rao & P. Raghavendra , Indian Heritage and culture, Sterling Publication Pvt. Ltd.
4) Madhukar kumar Bhagat, Indian Heritage and culture, Access Publications.
5) Dhirendra Singh, Indian Heritage and culture , APH Publications.
6) http://www.indiaculture.nic.in/
7) http://www.indiaculture.nic.in/world-heritage

II B.Tech, II-Sem (EEE)

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(A0016194) DESIGN THINKING FOR INNOVATION

(Skill Development Course)

(Common to CE, Mech, EEE, ECE & CSE)

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

After completion of this course, the student will be able to

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

STUDENTS' RESPONSIBILITIES:

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

UNIT-1:

Design Thinking Overview and Motivation

Introduction, What is Design thinking, Why design, Design is Everywhere, – Various perspectives, Four principles of successful innovation, A model of design Innovation process, Seven Modes of the Design Innovation Process, Understanding. Design Engineering vs. Engineering Design

UNIT-2:

Sense Intent and Know Context

Sense Intent: Mindsets, Sensing Changing Conditions, Seeing Overviews, Foreseeing Trends, Reframing Problems, Forming an Intent. Methods: Buzz Reports, Popular Media Scan, Key Facts, Innovation Sourcebook, Trends Expert Interview, Keyword Bibliometrics, Ten Types of Innovation Framework, Innovation Landscape, Trends Matrix, Convergence Map, From…To Exploration, Initial Opportunity Map, Offering-Activity-Culture Map, Intent Statement

Know Context: Mindsets, Knowing Context History, Understanding Frontiers, Seeing System Overviews, Understanding Stakeholders, Using Mental Models, Know Context: Methods, Contextual Research Plan, Popular Media Search, Publications Research, Eras Map, Innovation Evolution Map, Financial Profile, Analogous Models, Competitors-

Complementors Map, Ten Types of Innovation Diagnostics, Industry Diagnostics, SWOT Analysis, Subject Matter Experts Interview, Interest Groups Discussion.

UNIT-3:

Know People & Frame Insights

Know People: Mindsets, Observing Everything, Building Empathy, Immersing in Daily Life, Listening Openly, Looking for Problems and Needs, Know People: Methods, Research Participant Map, Research Planning Survey, User Research Plan, Five Human Factors, POEMS, Field Visit, Video Ethnography, Ethnographic Interview, User Pictures Interview, Cultural Artifacts, Image Sorting, Experience Simulation, Field Activity, Remote Research, User Observations Database,

Frame Insights: Mindsets, Exploring Systems, Looking for Patterns, Constructing Overviews, Identifying Opportunities, Developing Guiding Principles, Frame Insights: Methods, Observations to Insights, Insights Sorting, User Observation Database Queries, User Response Analysis, ERAF Systems Diagram, Descriptive Value Web, Entities Position Map, Venn Diagramming, Tree/Semi-Lattice Diagramming, Symmetric Clustering Matrix, Asymmetric Clustering Matrix, Activity Network, Insights Clustering Matrix, Semantic Profile, User Groups Definition, Compelling Experience Map, User Journey Map, Summary Framework, Design Principles Generation, Analysis Workshop

UNIT-4:

Explore Concepts

Explore Concepts: Mindsets, Challenging Assumptions, Standing in the Future, Exploring Concepts at the Fringes, Seeking Clearly Added Value, Narrating Stories about the Future, Explore Concepts: Methods, Principles to Opportunities, Opportunity Mind Map, Value Hypothesis, Persona Definition, Ideation Session, Concept-Generating Matrix, Concept Metaphors and Analogies, Role-Play Ideation, Ideation Game, Puppet Scenario, Behavioral Prototype, Concept Prototype, Concept Sketch, Concept Scenarios, Concept Sorting, Concept Grouping Matrix, Concept Catalog.

UNIT-5:

Frame Solutions

Frame Solutions: Mindsets, Conceiving Holistic Solutions, Conceiving Options, Making Value Judgments, Envisioning Scenarios, Structuring Solutions, Frame Solutions: Methods, Morphological Synthesis, Concept Evaluation, Prescriptive Value Web, Concept-Linking Map, Foresight Scenario, Solution Diagramming, Solution Storyboard, Solution Enactment, Solution Prototype, Solution Evaluation, Solution Roadmap, Solution Database, Synthesis Workshop

UNIT-6:

Realize Offerings

Realize Offerings: Mindsets, Reiterating Prototypes, Evaluating in Reality, Defining trategies, Implementing in Reality, Communicating Vision, Realize Offerings: Methods, Strategy Roadmap, Platform Plan, Strategy Plan Workshop, Pilot Development and Testing, Implementation Plan, Competencies Plan, Team Formation Plan, Vision Statement, Innovation Brief

TEXT BOOKS:

1. Vijay Kumar, “101 Design Methods: A Structured Approach for Driving Innovation in Your Organization”, John Wiley & Sons (2012) (ISBN: 978-1118083468)
2. Jeanne Liedtka and Tim Ogilvie , Designing for Growth: A Design Thinking Tool Kit for Managers, Columbia Business School Publishing, E-ISBN 978-0-231-52796-5
3. B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013

4. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)

REFERENCES:

1. Tim Brown, "Change by Design", Harper Business, 2012 (ISBN: 978-0062337382)
2. Daniel Ling, "Complete Design Thinking Guide for Successful Professionals", Create Space Independent Publishing, 2015 (ISBN: 978-1514202739)
3. Bruno Munari, "Design As Art", Penguin UK, 2009 (ISBN: 978-0141035819)
4. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)
5. Thomas Lockwood, "Design Thinking: Integrating Innovation, Customer Experience, and Brand Value", Allworth Press, 2009 (ISBN: 978-1581156683)
6. Joost Groot Kromelink, "Responsible Innovation: Ethics, Safety and Technology", 2nd ed., TU Delft, Faculty of Technology, Policy and Management, 2019 (e-Book ISBN: 978-9463662024)
7. Jimmy Jain, "Design Thinking for Start-up's: A Handbook for Readers and Workbook for Practitioners", Notion Press, 2018 (ISBN: 978-1642495034)
8. Beverly Rudkin Ingle, "Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work", A Press, 2013 (ISBN: 978-1430261810)

II B.Tech, II-Sem (EEE) P C
3 1.5

(A0594193) PYTHON PROGRAMMING LAB

(For branches CE, Mech, EEE, ECE, CSE)

COURSE OBJECTIVES:

- To be able to introduce core programming basics and various Operators of Python programming language.
- To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- To understand about Functions, Modules and Regular Expressions in Python Programming.

COURSE OUTCOMES:

- Student should be able to understand the basic concepts of scripting and the contributions of scripting language.
- Ability to explore python data structures like Lists, Tuples, Sets and dictionaries.
- Ability to create practical and contemporary applications using Functions, Modules and Regular Expressions.

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS

1) Program to demonstrate basic data type in python
2) Program to demonstrate operators in python
3) A cashier has currency notes of denominations 10, 50, and 100.If the amount to be withdrawn is input through the keyboard using input() function in hundreds, find the total number of currency notes of each denomination the cashier will have to give to the withdrawer
4) Program to demonstrate list and tuple in python
5) Write a program in Python, A library charges a fine for every book returned late. For first 5 days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message
6) Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs.12.00 per hour for every hour worked above 40 hours. Assume that employee do not work for fractional part of an hour.
7) Two numbers are entered through the keyboard; write a program to find the value of one number raised to the power of another.
8) Write a function that receives marks received by a student in 3 subjects and returns the average and percentage of these marks. Call this function from main() and print the result in main
9) Write a program to read a file and display its contents.
10) Write a program to demonstrate Regular Expressions in python.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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3 1.5

(A0493194) IC AND PDC LAB

COURSE OBJECTIVES:

At the end of the course the student is expected to design

- Astable and mono stable multi vibrators.
- IC 741 OP-AMP applications.

COURSE OUTCOMES:

- Study the working principle of various Multivibrators (Bi-stable, Mono-stable, and Astable Multivibrators).
- Realize simple logic gates using diodes and transistors
- Realize Adder, integrator & differentiator using OP-Amp
- Realize different oscillator circuits and Function generator using IC741.
- Realize different multivibrators using IC555 timer
- Realize 4-bit DAC using OP-Amp.

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS:

1) Study of Logic Gates & Some Applications
2) Transistor as a switch
3) Finding of operating point in CE configuration
4) Common Emitter amplifier
5) Common Collector amplifier
6) IC 741 OP AMP Applications –Integrator Circuits
7) IC 741 OP AMP Applications- Differentiator Circuits
8) IC 555 Timer – Monostable Operation Circuits
9) IC 555 Timer – Astable Operation Circuits
10) Function Generator using 741 OP AMP
11) Schmitt Trigger Circuits – Using IC 741 and IC 555
12) 4 bit DAC using 741 OP AMP

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3 1.5

(A0294194) CONTROL SYSTEMS AND SIMULATION LAB

COURSE OBJECTIVES:

- To help the students understand and practice the modeling, simulation and to implementation of a physical dynamical system by a linear time invariant ordinary differential equation.
- To highlight the electrical modeling of a second order system and analyze the under damped, over damped and critically damped cases.
- To experimentally determine the transfer function of servo motor skills and techniques.

COURSE OUTCOMES:

- Obtain the moment of inertia experimentally and develop the transfer function of the given DC Servo System, (a) Armature controlled and (b) Field controlled cases.
- Study the AC servo motor and its characteristics. Also to set up a closed loop position control system and study the system performance.
- Set up a system for closed loop voltage regulation for a dc shunt generator its characteristics.
- Obtain the characteristics of the synchro systems and set up a synchro link position.
- To understand the behavior and characteristics of BODE PLOT, ROOT LOCUS, NYQUIST PLOT.
- Verification of theoretical concepts through experimentation.

MAPPING OF COs & POs

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

Note: The minimum of 10 experiments are to be performed from the following, out of which at least two should be software based.

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 expressions and application of speed control of motor.
4) Speed-torque characteristics of DC servo motor
5) Transfer function of DC motor
6) Effect of P, PD, PI, PID Controller on a second order systems
7) Transfer function of DC generator
8) Temperature controller using PID
9) Characteristics of magnetic amplifiers
10) Characteristics of AC servo motor
11) DC Position Control System

SOFTWARE BASED EXPERIMENTS

1) To plot root locus diagram of an open loop transfer function and determine range of gain ‘k’ for stability.
2) To plot a Bode diagram of an open loop transfer functions and examines the stability of the system.
3) To draw a Nyquist plot of an open loop transfer functions and examines the stability of the closed loop system.
4) To determine response of first order and second order systems for step input and compare theoretical and practical results.

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L	T	C
2	1	3

(A0211195) ELECTRICAL MACHINES-II

COURSE OBJECTIVES:

- To learn the basic concepts of AC machines.
- To gain knowledge on construction and operation of AC machines.
- To analyze the behavior of single and poly phase AC machines.
- To study the different speed control techniques adopted.
- To examine the performance characteristics of AC machines.

COURSE OUTCOMES:

- To remember about fundamentals of AC machines.
- To understand the construction and working of AC machines.
- To evaluate the performance of AC machine.
- To apply the knowledge of AC machines to solve numerical problems.
- To test the behavior of AC machines with relevant techniques.

MAPPING OF COs & POs:

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

UNIT I SINGLE PHASE TRANSFORMERS-CONSTRUCTION & OPERATION

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 II TESTING OF SINGLE-PHASE TRANSFORMER

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

UNIT III THREE PHASE TRANSFORMERS

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Third harmonics in phase voltages-three winding transformers-tertiary windings- off load and on load tap changing; Scott connection.

UNIT IV THREE PHASE INDUCTION MOTORS

Poly-phase induction motors-construction 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 pf at standstill and during operation- Rotor power input, rotor copper loss and mechanical power developed and their inter relation-crawling and cogging.

UNIT V CHARACTERISTICS OF INDUCTION MOTORS

Torque equation-derivation of torque equation - expressions for maximum torque and starting torque - torque slip characteristic- Circle diagram-no load and blocked rotor tests-predetermination of performance-methods of starting and starting current and torque calculations

UNIT VI SPEED CONTROL METHODS

Speed control-change of frequency; change of poles and methods of consequent poles; cascade connection- induction generator-principle of operation.

TEXT BOOKS:

1) Electric Machines, Dr. P. S. Bimbra, Publisher: Khanna Books, ISBN: 9789386173294, 9386173298, Edition: 2, 2021.
2) A Textbook Of Electrical Technology, B L Theraja, ISBN- 9788121924375, Publiser: S. Chand, Edition: Vol 2 Ac And Dc Machines,23/e.
3) Electric Machines, Ashfaq Husain and Harroon Ashfaq, Publisher : Dhanpat Rai & Co. (P) Limited; ISBN-10 : 8177001663, ISBN-13 : 978-8177001662, Third edition (1 January 2016).
4) Electric Machines, D.P. Kothari and I.J. Nagrath, Publisher: Tata Mc Graw – Hill Publishers, ISBN-10: 935260640X, Edition: 5th.

REFERENCE BOOKS:

1) Electric Machinery, A Fitzgerald, Charles Kingsley, Stephen Umans, ISBN-10: 0070530394, Publisher: Tata Mc Graw – Hill.
2) Theory and Performance Electrical Machines, J. B. Guptha, Publisher: Katson Books, Edition 2014.
3) Principles of Electrical Machines, P.C.Sen, Publisher: Wiley, ISBN: 9789390395057, Edition: Third, 2020.
4) https://nptel.ac.in/courses/108/105/108105155/

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L	T	C
2	1	3

(A0212195) TRANSMISSION OF ELECTRICAL POWER

COURSE OBJECTIVES:

- This course is an extension of GENERATION & DISTRIBUTION OF ELECTRIC POWER course.
- It deals with basic theory of transmission lines modelling and their performance analysis.
- This course gives emphasis on mechanical design of transmission lines, cables and insulators.

COURSE OUTCOMES:

- To classify the different types of conductors, along with its virtual parameters in transmission system.
- To calculate the parameters (R, L, C) of transmission lines.
- The evaluation of performance of different Types of transmission lines.
- Describes travelling waves and various transients in transmission system.
- To analyze the mechanical design & aspects of transmission system.
- To know the importance of underground cables for transmission system and their applications.

MAPPING OF COs & POs:

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

UNIT I TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT II PERFORMANCE OF TRANSMISSION LINES

Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

Long Transmission Line-Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π – surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Skin Effect, Ferranti effect , Proximity effect.

UNIT III POWER SYSTEM TRANSIENTS

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems) - Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT IV CORONA

Corona - Description of the phenomenon, factors affecting corona, critical disruptive voltages, visual critical voltage and power loss due to corona, Radio Interference.

UNIT V DESIGN OF INSULATORS AND SAG ON OVERHEAD LINES

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding, Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT VI UNDERGROUND CABLES

Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables. Numerical problems.

TEXT BOOKS:

1) Principles of Power Systems- V. K. Mehta & Rohith Mehta. S. Chand, 2005.
2) Power System Analysis and Design- B.R Gupta, S. Chand & Co, 2005.
3) Electrical power systems -C. L Wadhwa, New Age International (P) Limited, Publishers, 2006.

REFERENCE BOOKS:

1) A Text Book on Power System Engineering -M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd, 2008.
2) Modern Power System Analysis - I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2007.
3) Power System Engineering - R. K. Rajput, Laxmi Publications, 2006.
4) https://nptel.ac.in/courses/108/102/108102047/

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L	T	C
2	1	3

(A0213195) POWER ELECTRONICS

COURSE OBJECTIVES:

- To prepare the students thorough in basic concepts of semiconductor devices used in Power Electronic converters.
- To Analyze and design different power electronic converter circuits. Like AC-DC, AC-AC, DC-DC, and DC-AC converters.

COURSE OUTCOMES:

- Understand fundamental concepts and techniques used in power electronic conversion.
- Ability to analyze operating principle of various single phase and three phase power converters.
- Understand the practical applications of power electronic converters in the various fields.
- Learn how to design the components in the various converters for different types of loads.
- Understand various control methods used in the power electronic converters to control power flow from source to load.
- Acquire knowledge about how to design an application-oriented power supply system.

MAPPING OF COs & POs:

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

UNIT I SINGLE PHASE AC-DC CONVERTERS

Introduction-Principle of phase control technique-Single phase full wave Midpoint, fully controlled, half controlled converters with R load, RL load & RLE load-Continuous and discontinuous current conduction mode of operations- Derivation of average and RMS load voltage and currents-Effect of freewheeling Diode-Effect of source inductance-performance factors of fully controlled and half controlled converters-Numerical problems.

UNIT II THREE PHASE AC-DC CONVERTERS

THREE PHASE AC-DC CONVERTERS: Introduction-Three phase half wave Converter-Three phase full wave fully controlled and half controlled converters with R load and RL load-Continuous and discontinuous current conduction mode of operations-Derivation of average load voltage-Numerical problems.

DUAL CONVERTERS: Principle of dual converter-practical dual converter with RL Load-circulating current mode of operation non-circulating current mode of operation (Only Operation and Waveforms).

UNIT III SINGLE PHASE AC-AC CONVERTERS:

AC VOLTAGE CONTROLLERS: Introduction-half wave and full wave ac voltage controllers with R Load and RL load-Derivation of RMS output voltage and power factor-principle of integral cycle or ON/OFF control method in the AC voltage controller-Numerical problems.

CYCLOCONVERTERS: Introduction-Single phase step down and step up cycloconverters-Midpoint and bridge type configurations with R load and RL load (Only operation and Waveforms).

UNIT IV DC-DC CONVERTERS

Introduction-principle of Step-down and Step-up Chopper-Derivation of load voltage and current-Time ratio control and Current limit control strategies–first quadrant chopper-second quadrant chopper- Steady state time domain analysis of first and second quadrant choppers with RLE load -Two quadrant choppers-Four quadrant choppers (principle of operation only).

UNIT V DC-AC CONVERTERS

SINGLE PHASE INVERTERS: Introduction-Single phase voltage source bridge inverters (VSI)–Half and full bridge inverters-Fourier analysis for output voltage waveforms-RMS voltage- Performance parameters of inverters-Voltage control techniques for inverters-Single Pulse Width Modulation (PWM)-Multiple PWM-Sinusoidal PWM-Current Source inverter-Numerical problems.

THREE PHASE INVERTERS: Introduction-Three phase voltage source bridge inverter-180^0 conduction mode and 120^0 conduction mode of operations-Fourier analysis for output voltage waveforms-Derivation of output RMS voltage-Voltage control techniques for inverters-Single Pulse Width Modulation (PWM)-Multiple PWM-Sinusoidal PWM-Numerical problems.

UNIT VI SWITCHED MODE POWER SUPPLIES

Introduction-Linear Power Supply-Switch Mode Power Supply (SMPS)-comparison between linear power supply and SMPS-Switch mode DC power supply block diagram-isolated DC to DC converters-Fly back converter-Forward converter-push pull converter.

Introduction of UPS–On line UPS and its specifications–off line UPS and its specifications.

TEXT BOOKS:

1) Power Electronics - P.S. Bimbhra, Khanna Publications, 2018.
2) Power Electronics –M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing Company, 2008.

REFERENCE BOOKS:

1) Power Electronics Handbook: Circuits, Devices and Applications – M. H. Rashid, Prentice Hall of India, 2004.
2) Power Electronics - V.R Murthy, OXFORD University Press, 2005.
3) Power Electronics - Essentials & Applications by L. Umanand, Wiley India Pvt. Ltd, 2009.
4) Power Electronics by V Ramanarayanan, 2006.
5) Power Electronics converters, applications and design-Ned Mohan, Wiley india,2006.
6) https://nptel.ac.in/courses/108/102/108102145/

III-B.Tech., I-Sem (EEE)

L	T	C
2	1	3

(A0214195) ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

COURSE OBJECTIVES:

- Electrical measurements course introduces the basic principles of all measuring instruments.
- It also deals with the measurement of voltage, current Power factor, power, energy.
- Instrumentation is essential in monitoring and analysis of any Physical system and its control.
- This course deals with different types of transducers, digital voltmeters, and measurement of non-electrical quantities.

COURSE OUTCOMES:

- To acquire the basic knowledge of measuring instruments and their characteristics.
- To understand the working of Digital Meters, Signal Analyzers and various transducers.
- To analyze different kind of measuring meters with their relevant equations analysis and solutions to numerical problems.
- To calibrate of DC, AC bridges and Potentiometers.
- To apply the acquired knowledge in measuring of electrical parameters such as voltage, frequency, Total Harmonic Distortion and the advantages of the above said instruments.
- To design the Q-meter for calculation of unknown parameters of radio frequency coils.

MAPPING OF COs & POs:

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

UNIT I MEASURING INSTRUMENTS - CHARACTERISTICS & ERRORS

Measuring Systems - Performance Characteristics - Static characteristics - Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, and Statistical Analysis of Random Errors

Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, Dynamometer, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance

UNIT II INSTRUMENT TRANSFORMERS AND D.C POTENTIOMETERS

CT and PT – Ratio and phase angle errors.

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage

UNIT III MEASUREMENT OF POWER, POWER FACTOR & ENERGY

Single phase dynamometer wattmeter, LPF and UPF, Double element dynamometer wattmeter, expression for deflecting and control torques.

Types of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters

Single phase induction type energy meter – driving and braking torques – errors and compensations-Adjustments.

UNIT IV D.C & A.C BRIDGES

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss

of charge method & Meggar. Measurement of inductance - Maxwell's bridge, Hay's bridge, Anderson's bridge - Measurement of capacitance and loss angle - Desauty bridge, Wien's bridge – Schering Bridge.

UNIT V ELECTRONIC MEASUREMENTS

Digital voltmeters - Successive approximation, ramp, dual-Slope integration, continuous balance type - Microprocessor based ramp type DVM, Digital Frequency meter-Digital Phase angle meter - Vector impedance meter, Q meter - Peak reading and RMS voltmeters

UNIT VI TRANSDUCERS

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications. Strain gauge and its principle of operation, Gauge factor, Thermistors, Thermocouples, Synchros, Piezo Electric transducers, Photovoltaic, Photo Conductive cells, Photo Diodes.

TEXT BOOKS:

1) Electrical & Electronic Measurement & Instruments by A.K.Sawhney, 19th edition Dhanpat Rai & Co. Publications, 2011.
2) Electronic Instrumentation by H. S. Kalsi, 4th edition Tata Mc Graw-Hill, 2019.
3) Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 3rd Edition Reem Publications, 2011.
4) Transducers and Instrumentation by D. V. S Murthy, 2nd edition Prentice Hall of India, 2008.

REFERENCE BOOKS:

1) Measurements Systems, Applications and Design, by D O Doeblin, 4th edition McGraw Hill Higher Education, 1990.
2) Principles of Electrical Measurements by Buckingham and Price, 1st edition Hodder and Stoughton Ltd., 1966.
3) Measurement and Instrumentation Principles by A.S Morris, 3rd edition, Butterworth-Heinemann, 2001.
4) Modern Electronic Instrumentation and Measurement techniques by A.D Helfrick and W.D. Cooper, 1st edition, Pearson/Prentice Hall of India, 2015.
5) Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 1st edition, S.Chand (G/L) & Company Ltd, 2008.
6) https://www.digimat.in/nptel/courses/video/108105153/L01.html
7) https://onlinecourses.nptel.ac.in/noc19_ee44/preview#

III-B.Tech., I-Sem (EEE)

L	T	C
2	1	3

(A0414195) BASICS OF SIGNALS AND SYSTEMS

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- Classification of continuous and discrete time signals and concept of orthogonality.
- Analyze the periodic and a periodic signals using Fourier analysis.
- Classify the systems based on their properties and determine the response of LTI system.
- Apply the Laplace transform and z-transform to analyze the continuous and discrete time signals.
- Concept of convolution, correlation and sampling theorem are useful for analysis in the areas of linear systems and communication theory.

MAPPING OF COs & POs:

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

UNIT-I INTRODUCTION TO SIGNALS

Definition of signals, Different types of signals, classification of signals, operations on signals, concepts of impulse function, Unit step function, Signum function, exponential and sinusoidal signals, Analogy between vectors and signals. Approximation of one signal to another signal.

UNIT-II REPRESENTATION OF SIGNALS USING FOURIER SERIES AND FOURIER TRANSFORMS

Representation of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum, Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, properties of Fourier transforms.

UNIT-III SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS

Classification of Systems, 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 physical realization-The poly-wiener criterion.

UNIT-IV CONVOLUTION AND CORRELATION OF SIGNALS

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution properties of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Properties of convolution, Relation between convolution and correlation.

UNIT-V LAPLACE TRANSFORMS

Review of Laplace transforms, 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's relation between L.T. and F.T. of a signal.

UNIT-VI SAMPLING THEOREM AND Z-TRANSFORM

Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, 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, BS Publications, 2003.
2) Signals and Systems - *A V Oppenheim A S Willsky* With S Hamid *Nawab,* Publisher: Prentice Hall; *2nd*Edition, 2011.

REFERENCE BOOKS:

1) Signals & Systems - *Simon Haykin,* Barry *Van Veen*, Signals and Systems*, 2nd edition,* John *iley* & Sons, 2003.
2) Network Analysis - M.E. Van Valkenburg, PHI Publications, 3rd Edn., 2000.
3) Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
4) Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, Pearson education.3rd Edition, 2004.

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III-B.Tech., I-Sem (EEE)

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(A0215195) SENSORS AND ACTUATORS

(Skill Development Course)

COURSE OBJECTIVES:

- To understand basics of sensors, actuators and their operating principle.
- To explain about sensors and its importance in the real world and also how to fabricate some of those sensors.
- To provide in-depth understanding on characteristic parameters to evaluate sensor performance.
- To explain working of various types of thermal, radiation, smart sensors and actuators.
- To provide information about interfacing and characterization of different sensors.

COURSE OUTCOMES:

- Able to choose electrical drives and actuators for various applications.
- Understand the operation of commonly employed sensors and actuators.
- Explain the characteristics and working principles of various types of sensors.
- Analyze the architecture of most commonly used actuators.
- Evaluate different sensors and apply them to the real time applications.
- Design and construct the appropriate interface circuits for the sensors and actuators.

MAPPING OF COs & POs:

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

UNIT – I Sensors / Transducers

Principles – Classification – Parameters – Characteristics - Environmental Parameters (EP) – Characterization Mechanical and Electromechanical Sensors: Introduction – Resistive Potentiometer – Strain Gauge – Resistance Strain Gauge – Semiconductor Strain Gauges - Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors - Ultrasonic Sensors.

UNIT – II Thermal Sensors

Introduction – Gas thermometric Sensors – Thermal Expansion Type Thermometric Sensors – Acoustic Temperature Sensor – Dielectric Constant and Refractive Index thermo sensors – Resistance Change Type Thermometric Sensors –Thermo emf Sensors– Junction Semiconductor Types– Thermal Radiation Sensors –Quartz Crystal Thermoelectric Sensors – Heat Flux Sensors- Magnetic sensors – Magneto resistive Sensors

UNIT – III Radiation Sensors

Introduction – Basic Characteristics – Types of Photosensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors Electro analytical Sensors- Sensor Electrodes.

UNIT – IV Smart Sensors

Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface – The Automation Sensors –Home Appliance Sensors – Aerospace Sensors – Sensors for Manufacturing –Sensors for environmental Monitoring.

UNIT – V Actuators

Working principles of Actuators - Piezoelectric and Piezoresistive actuators, Pneumatic and Hydraulic Actuation Systems - Directional Control valves – Pressure control valves – Cylinders - Servo and proportional control valves – Process control valves

UNIT - VI Mechanical Actuators

Rotary actuators Mechanical Actuation Systems- Types of motion – Kinematic chains – Cams – Gears – Ratchet and pawl – Belt and chain drives – Bearings – Mechanical aspects of motor selection Electrical Actuation Systems-Electrical systems -Mechanical switches – Solid-state switches Solenoids – D.C. Motors – A.C. motors – Stepper motors.

TEXT BOOKS:

1) D. Patranabis, “Sensors and Transducers”, PHI Learning Private Limited.
2) W. Bolton, “Mechatronics”, Pearson Education Limited.

REFERENCE BOOKS:

1) Patranabis, “Sensors and Actuators”, 2nd Edition, PHI, 2013.
2) https://nptel.ac.in/courses/108/108/108108147/

III-B.Tech., I-Sem (EEE)

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(A0015194) ENVIRONMENTAL SCIENCE

(Mandatory Learning Course-II)

(For Branches CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.
- Environmental education should be compulsory, right from the primary up to the post graduate stage.
- Environmental education should have an interdisciplinary approach by including physical, chemical, biological as well as socio-cultural aspects of the environment. It should build a bridge between biology and technology.
- Environmental education should take into account the historical perspective, the current and the potential historical issues.
- Environmental education should emphasize the importance of sustainable development i.e., economic development without degrading the environment.
- Environmental education should emphasize the necessity of seeking international cooperation in environmental planning.

COURSE OUTCOMES:

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

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE

Environment -Definition, Scope and importance, Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere)-Importance, Productivity, Aesthetical & Optional values of nature, Need for public awareness.

UNIT II RESOURCES AND UTILIZATION

Renewable and Non-renewable resources.

A) Natural Resources: Soil & Water sources (salinity intrusion –conflicts of over utilization of water Resources-water logging, Hydro power project-problems), forest & mineral resources – Utilization-problems.

B) Non-conventional resources of energy (Solar Energy, wind energy and their applications)

C) Chemical fertilizers and pesticides-problems.

UNIT III ECO-SYSTEMS

a) CONCEPTS OF ECO-SYSTEM

Structure and functions of an ecosystem: Producers, Consumers and Decomposers-Interaction between biotic and abiotic factors in an ecosystem- Energy flow and its importance- Trophic levels- Food chain- Food web –Ecological Pyramid, Ecological succession

b) TYPES OF ECOSYSTEMS

Understanding the types of ecosystems: (i) Terrestrial (forest and grassland) (ii) Aquatic (fresh water and salt water) with an example of each. (8 periods)

UNIT IV BIODIVERSITY

Introduction – Definition - genetic, species and ecosystem diversity- Biogeographical classification of India- Value of biodiversity - Biodiversity at global, National and Local levels- India as a mega diversity nation - Hot-spots of biodiversity- Threats to biodiversity- IUCN Red data book. Conservation of bio diversity (IN-SITU and EX-SITU conservation)

UNIT V ENVIRONMENTAL POLLUTION:

Introduction - Cause, effects and control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards

Municipal Solid Waste Management: Sources and Disposable methods.

Disaster management: Floods, Earthquake, Cyclone. (8 periods)

UNIT VI HUMAN POPULATION:

a) Population and Environment: Definition of species, community, population; Population growth rate curves, Sex ratio, From unsustainable to sustainable development,
b) Diseases- AIDS, Malaria, COVID, Cancer.
c) Human rights, Fundamental duties and Value education.
d) Women and Family welfare Programs. (8 periods)

SOCIAL ISSUES:

a) Climatic changes
b) Greenhouse effect and global warming.
c) Ozone layer depletion.
d) Acid rain.
e) Resettlement and rehabilitation of people.
f) Sustainability- water conservation methods- Rain water harvesting

TEXT BOOKS:

1) Deswal, S and Deswal A., (2004), A Basic Course in Environmental Studies, Dhanpat Rai & Co. Delhi.
2) Anubha Kousik and C P Kousik., New age international publishers.
3) Garg, S.K and Garg, R., (2006), Ecological and Environmental Studies, Khanna Publishers, Delhi.
4) Chauhan, A.S., (2006), Environmental Studies, Jain Brothers, New Delhi

REFERENCE BOOKS:

1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
3) Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
4) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
6) Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental
7) Encyclopedia, Jaico Publ. House, Mumabai, 1196p
8) De A.K., Environmental Chemistry, Wiley Eastern Ltd.

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3 1.5

(A0295195) ELECTRICAL MACHINES–I LAB

COURSE OBJECTIVES:

- To understand the practical connections of the machines.
- To draw the characteristics of different types of generators.
- To test the DC machines under different loading conditions to understand their performance.

COURSE OUTCOMES:

- Make the connections for DC machines.
- Selecting the meter ratings for various applications.
- Control the speed of the DC motor by different methods.
- Determine the efficiency of the given DC machine.

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS:

1) Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2) Load test on DC compound generator. Determination of characteristics.
3) Swinburne's test. Predetermination of efficiencies.
4) Brake test on DC compound motor. Determination of performance curves.
5) Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6) Separation of losses in a DC shunt motor.
7) Load test on DC shunt generator. Determination of characteristics.
8) Brake test on DC shunt motor. Determination of performance curves.
9) Field's test on DC series machines. Determination of efficiency.
10) Speed control of DC shunt motor.
11) Study of Starters (2-point, 3-point, 4-point).
12) Experimental Verification of Critical Speed and Critical Field Resistance.

III-B.Tech., I-Sem (EEE) P C
3 1.5

(A0296195) ELECTRICAL MEASUREMENTS LAB

COURSE OBJECTIVES:

- Electrical measurements lab introduces calibration of various meters like energy meter, power factor meter and measuring of energy, active and reactive power and testing of current transformers in measurement of unknown voltages and currents through potentiometers.

COURSE OUTCOMES:

- To apply basic knowledge of moving coil and moving iron instrument principles.
- To provide basic laboratory exposure to all electrical measuring instruments, their principles and applications.
- Determine ratio error and phase errors in CTs and PTs.
- Measure Resistance, Inductance and capacitance using AC and DC bridges.
- To understand the behavior and characteristics of different equipment.
- Verification of theoretical concepts through experimentation.

MAPPING OF COs & POs:

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

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. Measurement of 3-Phase power with Two-watt meter method (Balanced & Unbalanced)
6. Schering bridge & Anderson bridge
7. Measurement of 3-Phase reactive power with single-phase wattmeter
8. Measurement of 3-Phase active power using 2-CTs and 1-Phase wattmeter

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

1. Measurement of % ratio error and phase angle of given C.T. by comparison.
2. Dielectric oil testing using H.T. testing Kit
3. Optical bench – Determination of polar curve measurement of MHCP of filament lamps
4. Calibration LPF wattmeter – by Phantom testing
5. Transformer turns ratio measurement using AC Bridge.
9. Measurement of resistance using Wheatstone's Bridge

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3 1.5

(A0297195) POWER ELECTRONICS LAB

COURSE OBJECTIVES:

- This course is intended to acquire practical knowledge about the operation of various power converters.
- To understand the basics of triggering circuits required for various power converters.

COURSE OUTCOMES:

- To get Laboratory knowledge on basic power electronics circuits for control and conversion of electrical power.
- To familiarize the students by introducing modern engineering simulation tools like P-Sim, MATLAB and help them to simulate and analyses of different power Converters.
- To understand analysis and design of power electronics converters including AC-DC, DC-AC, and DC-DC through simulation.
- To understand the operating characteristics of different converters, regulators and inverters.
- To evaluate the performance factors of different converters practically.
- To verify the performance of different converters and inverters using software tool.

MAPPING OF COs & POs:

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

CHOOSE ANY TEN EXPERIMENTS IN THE FOLLOWING LIST

1. Single Phase Half-wave converter with R and RL load.
2. Single Phase Fully controlled bridge converter with R and RL load.
3. Single Phase Half controlled converter with R and RL load.
4. Single Phase Dual converter with RL load
5. Single Phase AC Voltage Controller with R and RL Load.
6. Single Phase Cyclo-converter with R and RL Load.
7. Three Phase Fully controlled bridge converter with R and RL load.
8. Three Phase Half controlled bridge converter with R and RL load.
9. Step down Chopper with R and RL load
10. Step up Chopper with R and RL load.
11. Single Phase full bridge Inverter with R and RL load.
12. Three Phase Inverter with 180^0 conduction mode.
13. Three Phase Inverter with 120^0 conduction mode.
14. Speed control of DC Motor using first quadrants Chopper.
15. Speed control of DC Motor using four quadrants Chopper.
16. Simulation of step-down chopper.
17. Simulation of step-up chopper.
18. Simulation of single-phase full bridge inviter by using PWM control.
19. Simulation of three phase inverter.
    a. With 180° Conduction mode
    b. With 120° Conduction mode.
20. Simulation of three phase inverter by using PWM control.

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(A0216196) ELECTRICAL MACHINES-III

COURSE OBJECTIVES:

- To gain knowledge on construction and operation of Synchronous machines.
- To analyze the behavior of Synchronous machines.
- To apply mathematical skills to understand the performance of synchronous machines.
- To gain idea on double filed revolving theory.

COURSE OUTCOMES:

- Classify Synchronous Machines based on constructional and operational features.
- Evaluate the behavior of Synchronous machines.
- Acquire the knowledge of applying mathematical skills to analyze the performance.
- Sketch and analyze the Characteristics of Synchronous machines based on application.
- Analyze the behavior of single and poly phase AC machines by testing.

MAPPING OF COs & POs:

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

UNIT I SYNCHRONOUS GENERATOR – CHARACTERISTICS

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.

UNIT II REGULATION OF SYNCHRONOUS GENERATOR

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 III PARALLEL OPERATION OF SYNCHRONOUS GENERATOR

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

UNIT IV SYNCHRONOUS MOTORS – PRINCIPLE OF OPERATION

Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed.

UNIT V POWER CIRCLE DIAGRAM

Excitation and power circles – hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT VI SINGLE PHASE MOTORS

Single phase Motors: Single phase induction motor – Constructional features-Double revolving field theory – Elementary idea of cross-field theory – split-phase motors – shaded pole motor.

TEXT BOOKS:

1) Electric Machines, Dr. P. S. Bimbra, Publisher: Khanna Books, ISBN: 9789386173294, 9386173298, Edition: 2, 2021.

2) A Textbook Of Electrical Technology, B L Theraja, ISBN- 9788121924375, Publiser: S. Chand, Edition: Vol 2 Ac And Dc Machines,23/e.
3) Electric Machines, Ashfaq Husain and Harroon Ashfaq, Publisher: Dhanpat Rai & Co. (P) Limited; ISBN-10 : 8177001663, ISBN-13 : 978-8177001662, Third edition (1 January 2016).
4) Electric Machines, D.P. Kothari and I.J. Nagrath, Publisher: Tata Mc Graw – Hill Publishers, ISBN-10: 935260640X, Edition: 5th.

REFERENCE BOOKS:

1) Electric Machinery, A Fitzgerald, Charles Kingsley, Stephen Umans , ISBN-10: 0070530394, Publisher: Tata Mc Graw – Hill,
2) Theory and Performance Electrical Machines, J. B. Guptha, Publisher: Katson Books, Edition 2014.
3) Principles of Electrical Machines, P.C.Sen, Publisher: Wiley, ISBN: 9789390395057, Edition: Third, 2020
4) https://nptel.ac.in/courses/108/105/108105155/

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L	T	C
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(A0217196) POWER SYSTEM PROTECTION

COURSE OBJECTIVES:

- To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- The study of different Circuit Breakers and Relays
- The protection of Generators and Transformers
- The protection of various feeder bus bars from abnormal conditions and over voltages & importance on Neutral grounding for overall protection.

COURSE OUTCOMES:

- List the concept of faults and arc quenching methods on the power system.
- Summarize the working of different protective devices and protection methods.
- Employ the different methods for the protection of power system components.
- Compare and contrast different protecting devices in the power system.
- Synthesize the different schemes to protect the power system components.
- Demonstrate the ability to conduct experiments in the Electrical Engineering Laboratory in accordance with Health and Safety Regulations and to record, interpret and report on the experimental results.

MAPPING OF COs & POs:

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

UNIT I ELECTROMAGNETIC RELAYS

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, solenoid type, induction type-induction disc & induction cup

Relay classification: Over current relays & types- differential relays – Directional power relay and directional overcurrent relay and Distance relays- Universal Torque equation.

UNIT II STATIC RELAYS

Static Relays – Advantages and Disadvantages – block diagram of static relay-static over current relays(block diagram)-Definite time, Inverse and directional static relays – Comparators –Amplitude and Phase comparators- Duality between Amplitude and Phase Comparator, Static amplitude comparator-integrating and instantaneous comparators, static phase comparators-coincidence type of phase comparator-phase splitting type, integrating type, time bias type.

UNIT III CIRCUIT BREAKERS

Circuit Breakers: Elementary principles of arc interruption, arc voltage, 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 IV 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 V PROTECTION OF FEEDERS, TRANSMISSION LINES & BUS-BARS

Requirements of line protection, Protection of Feeder (Radial, Parallel & Ring main) using over current Relays Protection of Transmission line-differential protection- voltage balance protection, translay protection – 3 Zone protection using Distance Relays - Carrier current protection- phase comparison carrier current protection.

Protection of Bus bars: Need of bus bar protection-busbar fault– Differential protection-high impedance relay scheme-frame leakage protection.

UNIT VI NEUTRAL GROUNDING & PROTECTION AGAINST OVER VOLTAGES

Ungrounded & grounded neutral systems-merits of neutral grounded systems-distinguish between equipment grounding & neutral grounding-methods of neutral grounding-Solid, Resistance, Reactance and Resonance Grounding-problems on Peterson coil grounding - Generation of Over Voltages in Power Systems-Lightning discharge -Protection against Lightning Over Voltages: Earthing screen- Overhead ground wire method- Lightning arrestor - Valve type and Zinc-Oxide Lighting Arresters.

TEXT BOOKS:

1) Switchgear and Protection – by Sunil S Rao, Khanna Publishers, 13th edition 2008.
2) Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications, 2nd Edition, 2011.
3) Fundamentals of Power System Protection by Y. G. Paithankar and S. R. Bhide, PHI, 2nd edition 2003.

REFERENCE BOOKS:

1) Electrical Power Systems – by C.L. Wadhwa, New Age international (P) Limited, Publishers, 7th edition 2016.
2) Electrical power System Protection by C. Christopoulos and A. Wright, Springer International Edition, 2nd edition, 1999.
3) https://nptel.ac.in/courses/108/101/108101039/

III-B.Tech., II-Sem (EEE)

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(A0218196) POWER SEMI-CONDUCTOR DRIVES

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

- Acquire the knowledge of power electronics converters and their control to drive different AC and DC machines.
- Analyze the working operation and solution to numerical problems of the drives and machines.
- Understand the characteristics and waveforms related to output voltage of power electronic converters and speed control of machines.
- Apply the acquired knowledge in implementation and choosing of power electronic converters to their relevant motors.
- Able to design the appropriate converter power ratings which are suitable to the industries.
- Inherent to the usage of simulation tools in power electronics and drives.

MAPPING OF COs & POs:

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

UNIT I CONTROL OF DC MOTORS BY 1-Φ CONVERTERS &3-Φ CONVERTERS

Introduction to Thyristor controlled Drives, Single Phase Fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed d.c motors.

Three phase Fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation -output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

UNIT II FOUR QUADRANT OPERATION OF DC DRIVES

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations - Four quadrant operation of D.C motors by dual converters – Closed loop operation of DC motor (Block Diagram Only)

UNIT III CONTROL OF DC MOTORS BY CHOPPERS

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 d.c Motors – Closed Loop operation (Block Diagram Only)

UNIT IV CONTROL OF INDUCTION MOTOR FROM STATOR SIDE

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)

UNIT V CONTROL OF INDUCTION MOTOR FROM ROTOR SIDE

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

UNIT VI 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.

TEXT BOOKS:

1) Fundamentals of Electric Drives – G K Dubey Narosa Publications, 2002
2) Power Electronic Circuits, Devices and applications -M. H. Rashid, Pearson, 2014.

REFERENCE BOOKS:

1) Power semiconductor controlled drives – G K Dubey, Simon & Schuster, 1993.
2) Power semiconductor drives - S.B.Dewan, Gordon R.Slemon, A.Straughen, Wiley, 1984.
3) Modern Power Electronics and AC Drives -B. K. Bose, Prentice Hall PTR, 2002.
4) Principles of Electric Machines and Power Electronics - P. C. Sen, Wiley India Pvt. Limited, 2007.
5) Thyristor DC drives-P.C.Sen, Krieger Publishing Company, 1991.
6) https://nptel.ac.in/courses/108/104/108104140/

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(A0219196) POWER SYSTEM ANALYSIS

(Professional Elective-I)

COURSE OBJECTIVE:

- To introduces formation of Y bus & Z bus of a transmission line.
- To give basic idea regarding power flow analysis by various power flow methods.
- To obtain the knowledge on power system network for various faults by short circuit analysis

COURSE OUTCOMES:

- To analyze the power flow study.
- To develop the power system network matrices.
- To summarize the load flow analysis for an electrical power system network and interpret the results of the analysis.
- To evaluate the both balanced and unbalanced fault currents.
- To understand the various types of various short circuit faults.
- To design power systems modals using MATLAB/Simulink.

MAPPING OF COs & POs:

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

UNIT I SHORT CIRCUIT ANALYSIS-I

Per-Unit System of Representation - Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Symmetrical Component Transformation, Positive, Negative and Zero sequence components. Symmetrical Component Theory: Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

UNIT II POWER SYSTEM NETWORK MATRICES-I

Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems on Y_{bus} with mutual coupling (max size 3x3) and without mutual coupling.

UNIT III POWER SYSTEM NETWORK MATRICES-II

Formation of Z_{Bus}: Partial network, Algorithm for the Modification of Z_{Bus} Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).

UNIT IV POWER FLOW STUDIES-I

Necessity of Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

UNIT V POWER FLOW STUDIES-II

Newton Raphson Method in Rectangular & Polar Co-Ordinate Form: Load Flow Solution with and without PV Busses- Algorithm and Flowchart. Comparison of Different Methods

UNIT VI SHORT CIRCUIT ANALYSIS-II

Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

TEXT BOOKS:

1) Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 3rd edition, 2007.
2) Power System Analysis by Nagsarkar and Sukhija, OXFORD University Press, 2nd edition, 2014.
3) Power Systems Analysis (Si) by John J. Grainger, William D. Stevenson, Gary W. Chang 2016.
4) Power System Analysis and Design by J. Duncan Glover, Thomas Overbye, Mulukutla S. Sarma 2016.

REFERENCE BOOKS:

1) Computer Methods in Power Systems, Stagg El – Abiad & Stags, Mc Graw-hill Edition, 1968.
2) Computer Techniques in Power System Analysis by M A Pai, 3rd Edition, TMH, 2014.
3) Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International, 2nd edition, 2014.
4) https://nptel.ac.in/courses/117/105/117105140/

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(A0220196) ENERGY MANAGEMENT & AUDIT

(Professional Elective-I)

COURSE OBJECTIVES:

- It introduces solar energy its radiation, collection, storage and application.
- It also introduces the Wind energy, Biomass energy, geothermal energy and ocean energy as alternative energy sources.

COURSE OUTCOMES:

- To understand the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels.
- Analyze the technological basis for harnessing renewable energy sources.
- Describe the main components of different renewable energy systems.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
- Design renewable/hybrid energy systems that meet specific energy demands, are economically feasible and have a minimal impact on the environment.
- Discuss how to utilize local energy resources (renewable and non- renewable) to achieve the sustainable energy system.

MAPPING OF COs & POs:

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

UNIT I

Introduction: Energy Scenario – global, sub continental and Indian, Energy economy relation, Future energy demand and supply scenario, Integrated energy planning with particular reference to Industrial Sector in India, Captive power units and others – demand v/s supply.

UNIT II

Types of Energy: Physical Aspects of Energy: Classification of energy – Hydel, Thermal, Nuclear, Wind, & from Waste Products. Efficiency and effectiveness of energy utilization in Industry. Energy and energy analysis. Renewable and non- renewable energy, Conventional and unconventional energy.

UNIT III

Demand Side Management: Energy Demand Management: Energy utilization, Instrumentation and data analysis, financial aspects of energy management, Energy management as a separate function and its place in plant management hierarchy. Energy Planning, Energy Staffing, Energy Organization, Energy Requirement. Energy Costing, Energy Budgeting, Energy Monitoring, Energy Consciousness, Energy Conversions, Energy Efficient Equipment, Energy Management Professionals, Environment Pollution due to Energy Use, Components of Pollution, Harmful Effects of Pollution, Measures taken to combat Pollution.

UNIT IV

Energy Audit and Energy Saving: Energy Audit and analysis, Energy load measurements, System evaluation and simulation, Energy saving techniques and guidelines: Administrative control, Proper Measurement and monitoring system, Process control, proper planning & scheduling, Increasing capacity utilization, Improving equipment control, waste heat recovery, Change of energy source. Up

gradation of Technology. Change of product specifications, Use of High efficiency equipment, Design modification for better efficiency, improved periodic maintenance;

UNIT V

Energy Control Centers: Remote Telemetry; Remote Terminal Units; IEC TC 57 (870-5-1) Protocol Standard; Data Acquisition Procedure; Data Handling and Organization; Real Time Database; Alarm and Events; Disturbance Processing; Fault Locating Technology; Real Time Display; MIMIC Boards; Supervisory Remote Control; Load Dispatch Control Centers; Distribution Control Centers; Time Keeping Systems;

UNIT VI

Integration of Distributed and Renewable Energy Systems to Power Grids: DC-to-AC Converters; AC-to-AC Converters; DC-to-DC Converters; Plug-In Hybrid Electric Vehicles; Energy Storage Technologies; Micro grids.

Reference Books:

TEXT BOOKS

1) Paul W., O'callaghan; "Energy Management", McGraw Hill Book ompany
2) Steve Doty, Wayne C. Turner; "Energy Management Handbook", airmont Press Inc., GA 30047
3) Barny L. Capehart, Wainey C. Turner, William J. Kennedy; "Guide to Energy Management", Fairmont Press Inc., GA 30047
4) Handbook of Energy Engineering, Albert Thumann & Paul Mehta, The Fairmont Press, INC.
5) NPC energy audit manual and reports
6) Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

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(A0221196) POWER SYSTEM HARMONICS

(Professional Elective-I)

COURSE OBJECTIVES:

- This subject deals with the importance of harmonic, analysis of Effects of Harmonic, sours of harmonic and Filters.

COURSE OUTCOMES:

- Understand sources of harmonic
- Represent the mathematical model of THD
- Analyse the Types of harmonic.
- Design the Tuned filters and damped filters.

MAPPING OF COs & POs

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

UNIT I

Harmonic Analysis: Representation of harmonics, Fourier series and Coefficients, odd, even and half wave symmetry, phase sequence. Measures of harmonic distortion: voltage and current distortion factors, active and reactive power, apparent power, distortion power, power factor, current and voltage crest factors. Power in passive elements: power in a pure resistance, power in a pure inductance and power in a pure capacitance. Series and parallel resonance.

UNIT II

Harmonic Sources: Types of harmonic sources, Harmonic in transformers, normal excitation characteristics, determination of current wave shape in transformers, inrush current harmonics in transformers, Harmonic in rotating machines: mmf distribution of ac windings, slot harmonics, voltage harmonics produced by synchronous machines, rotor saliency effects, voltage harmonics produced by induction motors. Distortion caused by arcing devices: Electric arc furnaces and discharge type lighting. Distortion caused by dc power supplies.

UNIT III

Effects of Harmonic Distortion in Power Systems: Thermal losses in harmonic environment: Copper losses, iron losses, dielectric losses. Harmonic amplification in capacitor banks. Effects of harmonics in transformers. Effects of harmonics in rotating machines: induced emf, chorded windings, distributed winding, winding factor. Harmonic interference with power system protection: harmonic problems during fault conditions. Effects of harmonics on consumer equipment. Interference with Communications.

UNIT IV

Limits of Harmonic Distortion: Voltage harmonic distortion limits: IEEE limits, IEC limits EN limits and NORSOK limit. Current harmonic distortion limits: IEEE limits IEC limits and NORSOK limits.

UNIT V Elimination of Power System Harmonics-I

Passive filters: Tuned filters and damped filters.

UNIT VI

Elimination of Power System Harmonics-II

Active filters: Series and parallel connection of active filters

Role of power converters, transformers, rotating machines and capacitor banks in reduction of harmonics. Harmonic filter design: Series tuned filters and second order damped filters.

REFERENCE BOOKS:

1) "Power System Harmonics" by J. Arrillaga and N. R. Watson, Wiley
2) "Power Systems Harmonics" by George J. Wakileh, Springer

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(A0512195) CORE JAVA PROGRAMMING

(Open Elective-I)
(For Branches EEE, Mech & ECE)

COURSE OBJECTIVES:

After taking this course, the student should be able to:

- Describe the Windows event-driven programming model
- Build simple JAVA applications according to the model
- Write fluent JAVA code for creating classes
- Use JAVA variables, data, expressions and arrays
- Design and create forms, menus and controls
- Write clear, elementary Java programs (applets and applications)
- Use a Java-enabled browser and/or the applet viewer to execute Java applets
- Use the Java interpreter to run Java applications
- Design and construct effective graphic user interfaces for application software.
- Use Java Beans, RMI to build complex business applications

COURSE OUTCOMES:

- Understand the syntax and concepts of JAVA
- Write JAVA programs to implementing Object Oriented Concepts
- Able to build directories and manage applications with interfaces
- Write JAVA programs that use data from flat files and databases
- Develop programs with error free and Multi-tasking.
- Program assignment utilizing Java GUI components, event listeners and event-handlers.

MAPPING OF COs & POs:

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

UNIT-I

Introduction To Java – Introduction to OOP, OOP Concepts, History of Java, Java buzzwords, How Java differs from C , Structure of Java Program, data types, variables, constants, type conversion and casting, enumerated types, scope and life time of variables, operators, expressions , control flow- conditional statements, break and continue, simple java program, arrays, parameter passing, static fields and methods, access control, this, overloading methods and constructors, recursion, garbage collection.

UNIT-II

Inheritance –Inheritance concept, Super and Sub classes, Member access rules, types of Inheritance, super uses, final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.

UNIT-III

Interfaces – Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Packages- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT-IV

Files – streams, text Input/output, binary input/output, random access file operations, File management using File class, Using java.io.

Strings: Strings, string functions.

UNIT-V

Exception handling – benefits of exception handling, exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, built in exceptions, creating own exceptions.

Multithreading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads, thread deadlock.

UNIT-VI

Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

TEXT BOOKS:

1) Java; the complete reference, 7th editon, Herbert schildt, TMH.
2) Understanding OOP with Java, updated edition, T. Budd, pearson eduction.

REFERENCES:

1) An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley & sons.
2) Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition.
3) An Introduction to OOP, second edition, T. Budd, pearson education.
4) Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.
5) An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
6) Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.
7) Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

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(A0508194) COMPUTER ORGANISATION AND ARCHITECTURE

(Open Elective-I)
(For Branches: EEE & CSE)

COURSE OBJECTIVES:

- To understand the structure, function, characteristics and performance issues of computer systems.
- To understand the design of the various functional Units of digital computers

COURSE OUTCOMES:

- Explain the organization of basic computer, its design & the design of control unit and trade-offs between hardware and software.
- Students will formulate and solve problems, understand the performance requirement of the systems and the operations & languages of the register transfer, micro-operations and input output organization.
- Students can understand how computer stores positive and negative numbers.
- Understand the organization of memory and memory management hardware.
- Elaborate advanced concepts of computer architecture, Parallel Processing, inter processor communication and synchronization.

MAPPING OF COs & POs:

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

UNIT I BASIC STRUCTURE OF COMPUTERS

Computer Types, Functional Unit, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers

DATA REPRESENTATION: Fixed Point Representation, Floating Point Representation - Error Detection codes

UNIT II REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS

Register transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro-operations, shift micro-operations

BASIC COMPUTER ORGANIZATION AND DESIGN: Instruction codes, Computer Registres, Computer instructions, Instruction cycle, Memory- reference instructions, Input – Output and Interrupt

UNIT III CENTRAL PROCESSING UNIT

Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control

COMPUTER ARITHMETIC: Fixed point operations - Addition and subtraction, multiplication, Division Algorithms

UNIT IV THE MEMORY SYSTEM

Basic concepts, semiconductor RAM memories, read-only memories, Cache memories, performance considerations, Virtual memories, secondary storage, Introduction to RAID.

UNIT V PIPELINE AND VECTOR PROCESSING

Parallel processing, Arithmetic pipeline, Instruction Pipeline, RISC Pipeline, Vector processing, Array Processors

UNIT VI MULTI PROCESSORS

Characteristics of Multi Processors, Inter Connection Structures, Inter Processor Arbitration; Inter Processor Communication & Synchronization, Cache Coherence

TEXT BOOKS:

1) Computer Systems Architecture – M. Moris Mano, Pearson/PHI

REFERENCE BOOKS:

1) Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, McGraw Hill.

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(A0517195) WEB PROGRAMMING

(For Branches: EEE & ECE)
(Open Elective-I)

COURSE OBJECTIVES:

- This course demonstrates an in-depth understanding of the tools and Web technologies necessary for business application design and development.
- The course covers client-side scripting like HTML, JavaScript and server side scripting like servlets, JSPs. And also XML and web servers and database interfacing.

COURSE OUTCOMES:

- Student can able to demonstrate the HTML important tags and for designing static web pages and separate design from content using CSS.
- Able to design a webpage with more user interactivity using JavaScript.
- Students can able to understand the need of XML in the developing of Web applications.
- Students able to understand the need of Server side scripting using Servlets and JSP.
- Able to develop the web applications with MVC architecture design using Struts.
- Students can able to apply the java programming to develop interactive of databases and develop the scalable web applications.

MAPPING OF COs & POs:

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

UNIT I INTRODUCTION TO HTML

HTML common tags, HTML program structure, Attributes, List, Tables, images, image maps, forms, Frames; Cascading Style sheets

UNIT II JAVASCRIPT

Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script, Data Validation using Java Script.

UNIT III XML

Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX

UNIT IV MORE ON SERVLETS

Reading Initialization parameters, the javax. Servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking

JSP Application Development

Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Sharing Data between JSP pages, Sharing Session and Application Data.

UNIT V STRUTS

Tomcat &Struts Installation, Struts Request life cycle, Struts Configuration file, Form Validation with Struts, Simple Struts application.

UNIT VI DATABASE ACCESS

Database Programming using JDBC, Types of JDBC Drivers, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions

AJAX: Introduction, Background, How AJAX works, Common steps AJAX will follow.

TEXT BOOKS:

1) HTML Black Book – Steve Holzner.
2) Web Programming, building internet applications, Chris Bates, WILEYD reamtech
3) The complete Reference Java 2 by Patrick Naughton and Herbert Schildt. TMH
4) Java Server Pages –Hans Bergsten, SPD O'Reilly

REFERENCE BOOKS:

1) Programming world wide web-Sebesta, Pearson.
2) Core SERVLETS AND JAVA SERVER PAGES VOLUME 1: CORE TECHNOLOGIES by Marty Hall and Larry Brown Pearson.
3) Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
4) Jakarta Struts Cookbook , Bill Siggelkow, S P D O'Reilly
5) Murach's beginning JAVA JDK 5, Murach, SPD.
6) An Introduction to web Design and Programming –Wang-Thomson.

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L	T	C
1	2	0.5

(A0222196) ARDUINO PROGRAMMING

(Skill Development Course)

COURSE OBJECTIVES:

- To Learn the Arduino programming language and IDE.
- To learn how to prototype circuits with Arduino UNO.
- To learn how to Program the Arduino board to make the circuits work for any given application.

COURSE OUTCOMES:

- Understand basics of Arduino programming and various types of functions libraries.
- Understand how to interface Arduino to various sensors and actuators.
- Gains Knowledge of interfacing various sensors and actuators.
- Able to Integrate hardware and software for embedded system for any given application

MAPPING OF COs & POs:

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

UNIT I EMBEDDED SYSTEM DESIGN

Basics, Introduction to embedded systems, Components of embedded system, Advantages and applications of embedded systems, Examples of real time embedded systems and how they are manufactured industry ready, Different Microcontroller Architectures (CISC, RISC, and ARISC), Internal Resources & Hardware Chips in Details, History of AVR Microcontrollers and Features.

UNIT II LEARNING ARDUINO PLATFORM

Arduino Overview, **Introduction** to Arduino, Arduino History and Family, Features, Board Types, Arduino Uno board Description, Arduino Program Structure, Data Types, Variables & Constants, Operators, Control Statements, Loops, Functions, Strings, Time, Arrays.

UNIT III ARDUINO FUNCTION LIBRARIES

Arduino I/O functions, Advanced I/O Functions, Character functions, Math Library, Trigonometric Functions.

UNIT IV LEARNING ARDUINO PLATFORM

Blinking Led, Fading Led, Reading Analog voltage, Led Bar Graph, Switches, Seven Segment Display, Multi Segment Displays, Relays (AC Appliance Control), LCD, Buzzer, DC motor, Stepper Motor.

UNIT V THE BASIC SENSORS AND ACTUATORS USING ARDUINO

Introduction to sensors and actuators; How to connect and work with different sensors, such as IR Sensor, Ultrasonic Sensor, Humidity, PIR Sensor, Water Detector Sensor, Accelerometer, Sound, Light Distance, Pressure etc., to ARDUINO Board, reading various sensor data on serial monitor and LCD Display.

UNIT VI PROJECT BASED ON EMBEDDED SYSTEM DESIGN USING ARDUINO BOARD

ARDUINO based home automation, ARDUINO Based Solar Street Light system, ARDUINO Based Alarm Clock, ARDUINO Based Car Parking System, etc.

BOOKS/REFERENCES:

1) Arduino-Based Embedded Systems: By Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury.

2) Arduino Cookbook by Michael Margolis, O'Reilly Media, Inc., 1st edition.
3) Arduino Made Simple by Ashwin Pajankar
4) https: //www.arduino.cc/en/Tutorial/HomePage
5) Arduino for beginners: Essential Skills Every Maker Needs, John Baichtal, Person Education, Inc

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L	T	C
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(A0018194) CONSTITUTION OF INDIA

(Mandatory Learning Course-III)
(For Branches CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

Students will be able to

- Study the structure and composition of Indian Constitution
- Learn about the federalism in the Indian context.
- Study the Panchayathi Raj Institutions as a medium of decentralization
- Learn about the three organs of the state in the contemporary scenario.

COURSE OUTCOMES:

Students will be able to

- Understand historical background of the constitutional making and its importance for building a democratic India.
- Be aware of the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
- Aware of Indian government, the structure of state government, the local Administration.
- Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions.

UNIT I

History of Indian Constitution: History of Making of the Indian Constitution - History Drafting Committee - Composition & Working of Constitution.

UNIT II

Philosophy of the Indian Constitution: Preamble Salient Features of Indian Constitution.

UNIT III

Contours of Constitutional Rights & Duties: Fundamental Rights: Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy.

UNIT IV

Organs of Governance: Parliament - Composition - Qualifications and Disqualifications Powers and Functions of Executive - President - Governor - Council of Ministers – Judiciary – Qualifications, Appointment and Transfer of Judges.

UNIT V

Local Administration: Role and Importance of Municipal Corporation Role and Importance Pachayati raj: Role and Importance Zilla Pachayat: Position and role - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT VI

Election Commission: Role and Functioning of Election Commission Role and Functioning of Chief Election Commissioner and Election Commissioners - Role and Functioning of State Election Commission.

TEXT BOOKS

1) Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2) The Constitution of India, PM Bhakshi, Universal Law

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T	P	C
0	3	1.5

(A0298196) INSTRUMENTATION LAB

COURSE OBJECTIVES:

- Instrumentation has introduced the measurement of various physical quantities like strain, temperature, displacement, pressure, vibration and speed.
- Change of dielectric in terms of electrical quantities measuring quality factor for R, L,C circuits and measuring of R,L,C using different bridges.

COURSE OUTCOMES:

- To acquire basic knowledge about transducers.
- To choose the proper transducer for measuring of various non-electrical quantities
- To improve measuring capabilities using Bourdon tube, LVDT and Thermistor.
- To measure passive electrical parameter R, L, C and Quality factor using Q meter.
- To convert the galvanometer into OHM meter and AC meter.

MAPPING OF COs & POS:

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

LIST OF EXPERIMENTS:

1) Measurement of strain using strain gauge. (Change in strain into resistance)
2) Measurement of temperature using RTD & Thermistor.
   (Change in temperature into Resistance)
3) Measurement of physical variable based on induced emf using Linear Variable Differential Transformer. (Change in displacement into Induced Voltage)
4) Measurement of pressure using bourdon tube. (Change in pressure into displacement)
5) Measurement of vibration using acceleration transducer.
6) Measurement of physical variables based on change in dielectric using Capacitive Pick-Up
7) Measurement of R, L, C and Quality factor using Q-meter
8) Measurement of speed using digital stroboscope
9) Conversion of D'Arsonal galvanometer into Ohm meter
10) Conversion of D'Arsonal galvanometer into AC meter (Current & Voltage)
11) pH measurement
12) Measurement of R, L, C using bridge circuits.

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T	P	C
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(A0299196) ELECTRICAL MACHINES-II LAB

COURSE OBJECTIVES:

- To understand the practical connections of AC machines.
- To calculate the various parameters of induction motor and synchronous machine.
- To analyze the performance of the induction motor and synchronous machine by conducting suitable experiments.

COURSE OUTCOMES: After the completion of this course, students will be able to:

- Analyze the performance of Induction and synchronous machines for their applications.
- Estimate the voltage regulation of AC Machines by various regulation methods.
- Determine the performance characteristics of AC machines by conducting suitable tests.
- Illustrate the synchronization of alternator to bus bar.
- Analyze the conversion principle employed in Scott connection of transformer.

MAPPING OF COs & POs:

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

The following experiments are required to be conducted compulsorily

1) OC & SC tests on single phase transformer (equivalent circuit, efficiency & regulation)
2) Scott connection of transformers
3) Parallel operation of single phase transformers
4) Separation of core losses in a single phase transformer
5) No-load & Blocked rotor tests on three phase Induction motor
6) Brake test on three phase Induction Motor
7) Regulation of three-phase alternator by a) Synchronous Impedance Method and b) MMF method
8) V and Inverted V curves of a 3 phase synchronous motor.
9) Equivalent Circuit of a single phase induction motor

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

1) Determination of X_d and X_q of a salient pole synchronous machine
2) Regulation of three-phase alternator by Z.P.F. method
3) Load test on three phase induction generator
4) Synchronization of three phase alternator by using Dark Lamp Method
5) Sumner's test on two identical transformers

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(A0223197) POWER SYSTEM CONTROL AND STABILITY

COURSE OBJECTIVES:

- This subject deals with Economic operation of Power Systems, Hydrothermal scheduling, Modeling of turbines, generators and automatic controllers are presented, single area and two area load frequency control and power system stability.

COURSE OUTCOMES:

- To provide students the knowledge of optimization techniques used in the power system.
- Analyze Economic operation of power system and importance of LFC control
- To understand of Hydrothermal scheduling in the power system
- To model and design turbine and Automatic controller.
- To express variation of frequency in the power system with varying load
- To design power systems modals using MATLAB/Simulink.

MAPPING OF COs &POs

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

UNIT-1

ECONOMIC OPERATION OF POWER SYSTEMS

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve-Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected-Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT-2

HYDROTHERMAL SCHEDULING

Optimal scheduling of Hydrothermal System: Short term coordination-Kirchmayers method-Plant scheduling methods - Constraints in Unit commitment - Hydro-Thermal scheduling (mathematical formulation and solution techniques) - Scheduling problems.

UNIT-3

MODELING OF TURBINE & GOVERNOR

Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models, Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram-Generator-Load Model.

UNIT-4

LOAD FREQUENCY CONTROL – I

Necessity of keeping frequency constant-Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control Proportional plus Integral control of single area and its block diagram representation- steady state response – Load Frequency Control and Economic dispatch control.

UNIT-5

POWER SYSTEM STABILITY-I

Elementary concepts of Steady State, Dynamic and Transient Stabilities - Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient,

Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

UNIT-6

POWER SYSTEM STABILITY-II

Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Methods to improve Transient Stability

TEXT BOOKS:

1. Modern Power System Analysis by I.J.Nagrath & D.P.Kothari., McGraw Hill Education, 2011, 4th Edition.
2. Power System Analysis Operation and Control by A. Chakravarthi and S. Halder, PHI Learning Pvt. Ltd, 2010, 3rd Edition.

REFERENCES BOOKS:

1. Elements of power system analysis by William. D Stevenson Jr., McGraw Hill Education, 2017, 4th Edition.
2. Power generation, operation, and control Allen J. Wood, Bruce F. Wollenberg., Wiley - Interscience Publication, 1996, 2nd Edition.
3. Electric Energy Systems Theory: An Introduction by Olle I. Elgerd, Mc Graw-hill Edition, 1982, 2nd Edition.
4. Electric Power Systems by Syed A. Nasar, (Schaum's Outline Series, Revised), McGraw Hill, 1989, 1st Edition.

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L	T	C
2	1	3

(A0224197) SMART GRID TECHNOLOGIES

(Professional Elective-II)

COURSE OBJECTIVES:

- To provide students with a working knowledge of fundamentals and development of Smart Grid, from the basic concepts of power systems.
- Know the importance of smart grid technology functions over the present grid.
- Get the knowledge about the renewable energy storage technology associated with smart grid.

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Understand the features of Smart Grid
- Assess the role of automation and digitization in Transmission and Distribution
- Develop skills required for smart grid planning & formulation of regulations.
- Analyse Smart grids and Distributed Energy Resources (DER) with evolutionary algorithms
- Understand operation and importance of data acquisition devices and their location in Voltage and Frequency control

MAPPING OF COs &POs

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

UNIT-1

SMART GRID ARCHITECTURAL DESIGNS

Introduction – Comparison of Power grid with Smart grid – power system enhancement – communication and standards - General View of the Smart Grid Market Drivers - Stakeholder Roles and Function - Measures - Representative Architecture - Functions of Smart Grid Components.

UNIT-2

SMART GRID COMMUNICATIONS AND MEASUREMENT TECHNOLOGY

Communication and Measurement - Monitoring, Phasor Measurement Unit (PMU), Smart Meters, Wide area monitoring systems (WAMS) - Advanced metering infrastructure- GIS and Google Mapping Tools- Multiagent systems technology.

UNIT-3

PERFORMANCE ANALYSIS TOOLS FOR SMART GRID DESIGN

Introduction to Load Flow Studies - Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods - Load Flow State of the Art: Classical, Extended Formulations, and Algorithms –Load flow for smart grid design-Contingencies and their classification- Contingencies studies for smart grid.

UNIT-4

STABILITY ANALYSIS TOOLS FOR SMART GRID

Voltage Stability Analysis Tools-Voltage Stability Assessment Techniques-Voltage Stability Indexing-Application and Implementation Plan of Voltage Stability in smart grid-Angle stability assessment in smart grid.

UNIT-5

PATHWAY FOR DESIGNING OF SMART GRID: Introduction-Barriers and solutions to smart grid development-General level automation-Bulk power systems automation of smart

grid at transmission level-Distribution system automation requirement of power grid-End user of the smart grid.

UNIT-6

RENEWABLE ENERGY AND STORAGE

Renewable Energy Resources-Sustainable Energy Options for the Smart Grid-Penetration and Variability Issues Associated with Sustainable Energy Technology-Demand Response Issues-Electric Vehicles and Plug-in Hybrids-PHEV Technology-Environmental Implications-Storage Technologies-Grid integration issues of renewable energy sources

TEXT BOOKS:

1. Smart Grid - Fundamentals of Design and Analysis by James Momoh, Wiley& sons Inc, IEEE press 2012.
2. Smart Grid: Technology and Applications by Janaka B. Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, John Wiley & sons Inc, 2012.

REFERENCE BOOKS:

1. Smart Grid: Integrating Renewable, Distributed and Efficient Energy by Fereidoon P. Shoshonis, Academic Press, 2012.
2. The smart grid: Enabling energy efficiency and demand response by Clark W. Gellings, Fairmont Press Inc, 2009.

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(A0225197) POWER QUALITY

(Professional Elective-II)

COURSE OBJECTIVES:

- This subject deals with the Voltage sags, Power interruptions, Harmonics and Devices used to reduce the harmonics

COURSE OUTCOMES:

- To understand the basics in power quality such as sag, swell and interruptions, power quality, voltage quality etc.,
- To analyze the power quality disturbances and determine the remedy in improving power quality.
- To analyze the occurrence of harmonics in voltage and current because of non-sinusoidal quantities during transients and faults.
- To improve the ability in evaluating harmonic distortions
- To understand the transient over voltages and its problems.
- Ability to design basic filters to reduce harmonic distortion.

MAPPING OF COs &POs

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

UNIT-1

INTRODUCTION

Power quality, Voltage quality, Concern, power quality Evaluation procedure, Transients, Long-duration- short duration-voltage variations, voltage imbalance, wave form distortion, voltage fluctuation, power frequency variations, power quality terms, CBEMA and ITI curves

UNIT-2

VOLTAGE SAGS AND INTERRUPTIONS

Sources of sagas and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-user level, Motor-starting sags, and utility system fault-clearing issues.

UNIT-3

TRANSIENT OVER VOLTAGES

Sources of over voltages, principles of over voltage protection, devices for over voltage protection, utility capacitor-switching transients, utility system lightning protection, switching transient problems with loads

UNIT-4

FUNDAMENTALS OF HARMONICS

Harmonic Distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, Harmonic indices, Harmonic sources from commercial loads, Harmonic sources from Industrial loads, system response characteristics, effects of harmonic distortion

UNIT-5

EVALUATION OF HARMONICS

Harmonic distortion evaluations, Principles of Controlling Harmonics, Harmonic studies, Devices for Controlling Harmonic Distortion

UNIT-6

LONG-DURATION VOLTAGE VARIATIONS

Principles of regulating the voltage, Devices for voltage regulation, utility voltage regulator Application, capacitors for voltage regulation flicker- power quality measuring equipment

TEXT BOOKS:

1. Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H.Wayne Beaty, McGraw Hill Education Pvt. Ltd, 2012, 2nd Edition.
2. Power quality by C. Sankaran, CRC Press, 2002, 1st Edition.

REFERENCE BOOKS:

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson, S. Chen, John Wiley & Sons, 2000.
2. Understanding Power quality problems by Math H. J. Bollen, Wiley-IEEE Press, 1999, 1st Edition.
3. Power system harmonic analysis by J. Arrillaga, John Wiley & Sons, 1997
4. Power quality in electrical systems by Alexander Kusko, Marc T. Thompson, McGraw Hill, 2007, 1st Edition.

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(A0226197) OPTIMIZATION TECHNIQUES

(Professional Elective-II)

COURSE OBJECTIVES:

- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming.
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

COURSE OUTCOMES:

- To Explain the need of optimization of engineering systems
- To Understand optimization of electrical and electronics engineering problems
- To apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- To apply unconstrained optimization and constrained non-linear programming and dynamic programming
- To Formulate optimization problems.

MAPPING OF COs &POs:

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

UNIT-1

INTRODUCTION AND 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-2

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-3

TRANSPORTATION PROBLEM

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.

UNIT-4

UNCONSTRAINED NON-LINEAR PROGRAMMING

One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method Unconstrained Optimization Techniques: Uni-variant method, Powell's method and steepest descent method.

UNIT-5

CONSTRAINED NON-LINEAR PROGRAMMING: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method Basic approach of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT-6

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 by Singiresu S. Rao, John Wiley and Sons, 4th edition, 2009.
2. Introductory Operations Research by H. S. Kasene & K. D. Kumar, Springer (India), Pvt. Ltd., 2004.

REFERENCE BOOKS:

1. Linear programming by George Bernard Dantzig, Mukund Narain Thapa, Springer series in operations research, 2003, 3rd Edition.
2. Operations Research: An Introduction by H. A. Taha, Pearson/Prentice Hall, 2007, 8th Edition.
3. Optimization for Engineering Design – Algorithms and Examples by Kalyanmoy Deb, PHI Learning Pvt. Ltd, New Delhi, 2005.

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(A0227197) HIGH VOLTAGE DIRECT CURRENT TRANSMISSION

(Open Elective-II)

COURSE OBJECTIVES:

- This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters.

COURSE OUTCOMES:

- To understand the economic aspects of Transmission System
- To analyze the usage of HVDC convertors
- To understand the working of convertors and its control in HVDC system.
- To understand the reactive power control and alternate control strategies using shunt capacitors and synchronous condensers.
- To analyze the convertor faults and protection using filters, surge arrestors and smoothing reactors.

MAPPING OF COs &POs

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

UNIT-1

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.

UNIT-2

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-3

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.

UNIT-4

REACTIVE POWER CONTROL IN HVDC

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

UNIT-5

CONVERTER FAULTS & 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-6

HARMONICS& FILTERS

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 -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, Wiley Blackwell, 1991.
2. EHV-AC, HVDC Transmission & Distribution Engineering byProf. Sunil S. Rao, Khanna Publishers, 1993.

REFERENCE BOOKS:

1. High Voltage Direct Current Transmission by Jos Arrillaga, Institution of Engineering and Technology, 1998, 2nd Edition.
2. Direct Current Transmission by E.W.Kimbark, Wiley-Blackwell, 1971.
3. Power Transmission by Direct Current by E.Uhlmann, Springer (India) Pvt. Ltd, 2004.

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(A0228197) HIGH VOLTAGE ENGINEERING

(Open Elective-II)

COURSE OBJECTIVES:

- This subject deals with the detailed analysis of Breakdown occur in gaseous, liquids and solid dielectrics.
- Information about generation and measurement of High voltage and current. In addition the High voltage testing methods are also discussed.

COURSE OUTCOMES:

- To introduce High Voltage technologies and applications.
- To analyze the breakdown in solid, gases and liquid dielectrics.
- To understand the generation and measurement of high voltages and currents.
- To coordinate over voltage phenomenon and insulation.
- To improve the testing skills in the field of high voltage electrical operators

MAPPING OF COs &POs

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

UNIT-1

INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS

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-2

BREAK DOWN IN SOLID, GASEOUS AND LIQUID DIELECTRICS

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice
Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law - Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids

UNIT-3

GENERATION& MEASUREMENT OF HIGH VOLTAGES AND 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-4

OVER VOLTAGE PHENOMENON AND 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-5

NON-DESTRUCTIVE TESTING OF MATERIALSAND ELECTRICAL APPARATUS:

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements

UNIT-6

HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS

Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – McGraw Hill, 2020, 6th Edition.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2000, 2nd Edition.

REFERENCE BOOKS:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 2012, 3rd Edition.
2. High Voltage Insulation Engineering by Ravindra Arora and Wolfgang Mosch, Wiley-IEEE Press, 2011, 1st Edition.

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(A0511194) DATABASE MANAGEMENT SYSTEMS

(Open Elective-II)
(For Branches: EEE & CSE)

COURSE OBJECTIVES:

- Advantages applications of DBMS and Database system structure.
- Schema design: ER model and conceptual design.
- Relational Model, Formal Query Languages and SQL basis.
- Storage and efficient retrieval of data: various indexing techniques.
- Schema refinement: normalization and redundancy removal and functional dependant.
- Transaction management: locking protocols, serializability concepts etc.

COURSE OUTCOMES:

- Understand the basic concepts of database and various data model used in database design and ER modelling concepts and architecture.
- Use different integrity constraints in defining database objects
- understand and apply their knowledge in solving procedural and non-procedural language queries
- Create good relational schema by applying normalization methodologies
- Determine the significance of concurrency control mechanism in transaction
- Illustration of various File organization techniques and different storage mediums.

MAPPING OF COs & POs

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

UNIT-1

Database System Applications, database System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Database Languages – DDL – DML – Database Access for applications Programs – Database Users and Administrator – Transaction Management – Database System Structure – Storage Manager – the Query Processor- Data base design and ER diagrams – Beyond ER Design- Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with the ER Model.

UNIT-2

Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical database Design – Introduction to Views – Destroying /altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra queries – Relational calculus – Tuple relational Calculus – Domain relational calculus.

UNIT-3

The Form of a Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries, Set – Comparison Operators – Aggregate Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT – Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL, Triggers and Active Data bases.

UNIT-4

Schema refinement – Problems Caused by redundancy – Decompositions – Problems related to decomposition – Functional dependencies-reasoning about FDS – FIRST, SECOND,

THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT-5

Overview Of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of transactions-Lock Based Concurrency Control, Performance of Locking, Transaction Support in SQL.

Concurrency Control: 2PL, Serializability and recoverability, Introduction Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking.

UNIT-6

Data on External Storage – File Organizations and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – The Memory Hierarchy, RAID, Disk Space Management, Buffer Manager, Files of Records, Page Formats, record Formats.

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishna, Johannes Gehrke, TATA McGraw Hill 3rd Edition 2017
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, 6th edition, 2013.

REFERENCES:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 11th Edition, 2016.
2. Fundamentals of Database Systems, Elmasri Navathe Pearson Education.
3. Introduction to Database Systems, C.J.Date Pearson Education.
4. https://www.oreilly.com/library/view/concepts-of-database/9789332537422/xhtml/bibliography.xhtml
5. https://en.wikipedia.org/wiki/Database
6. https://www.sanfoundry.com/best-reference-books-database-management-systems/

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(A0424197) EMBEDDED CONTROLLERS

(Professional Elective-III)

COURSE OBJECTIVES:

- Understand need of microprocessors and microcontrollers in development of various projects.
- To know complete architectural, programming, interfacing details of 8085, 8086 microprocessors and 8051 microcontroller.

COURSE OUTCOMES:

- Learn and understand the instruction set of 8086 and 8051.
- Develop skill in simple assembly program writing for 8086, 8051 and applications.
- Learn and understand concept of interfacing of peripheral devices and their applications.
- Ability to learn Microprocessor and Microcontroller Architecture.
- Understand & design of microprocessors and microcontrollers based systems (small).

MAPPING OF COs & POs

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

UNIT-1

INTRODUCTION-8086

Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Signal descriptions of 8086-common function signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

UNIT-2

INSTRUCTION FORMATS

Addressing Modes, Instruction Set of 8086, Assembler Directives, Macros and Procedures with sample programs based on Sorting, Multiplication, Division and multi byte arithmetic code conversion, String Manipulation instructions and Simple ALPs.

UNIT-3

INTRODUCTION TO EMBEDDED SYSTEMS

Introduction, embedded controller, concept of microcontroller, comparison of microprocessor and microcontroller, Intel 8051 microcontroller architecture, pin diagram, special function registers, external memory interface with 8051, operation of I/O ports.

UNIT-4

INSTRUCTION SET OF 8051

Data exchange, byte level logical operations, bit level logical operations, rotate and swap operations, instruction affecting flags, incrementing, decrementing, arithmetic operations, jump and recall instruction, assembly language programming of 8051 Calls and subroutines, interrupts and returns

UNIT-5

COUNTERS AND TIMERS IN 8051

Counters and timers in 8051, timer modes, Serial data input, output , serial data modes, interrupts, timer flag interrupt, serial port interrupt, external interrupts, software generated interrupt control, Addressing modes, external data moves, code memory, read only data moves. Push and Pop.

UNIT-6

8051 MICRO CONTROLLER USING EMBEDDED C

Introduction to Embedded Systems-Installation of Keil IDE-Input and Output interfaces-Few programs on LEDs-Few programs on interfaces-Interfacing with DC Motor and Relays.

TEXT BOOKS:

1. Advanced microprocessor and peripherals by A.K. Ray and K.M.Bhurchandi, McGraw-Hill Education, 2000, 2nd Edition.
2. 8051 microcontroller and embedded systems by Mazidi Muhammad Ali, Pearson Education India, 2000, 2nd Edition.

REFERENCES:

1. Microprocessors and Interfacing: Programming and Hardware by Douglas V. Hall, Revised 2nd edition, 2007.
2. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications by Walter A. Triebel, Avtar Singh, Pearson, 2003, 4thEdition.
3. 8051 Microcontroller: Internals, Instructions, Programming and Interfacingby Subrata Ghoshal, Pearson, 2010, 1stEdition.

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(A0425197) MICROCONTROLLER BASED SYSTEM DESIGN

(Professional Elective-III)

COURSE OBJECTIVES:

- To introduce the architecture of PIC microcontroller
- To educate on use of interrupts and timers
- To educate on the peripheral devices for data communication and transfer
- To introduce the functional blocks of ARM processor
- To educate on the architecture of ARM processors

COURSE OUTCOMES:

- To understand the basics and requirement of processor functional blocks.
- Observe the specialty of RISC processor Architecture.
- Incorporate I/O hardware interface of a processor based automation for consumer application with peripherals.
- Incorporate I/O software interface of a processor with peripherals.
- Improved Employability and entrepreneurship capacity due to knowledge up gradation on recent trends in commercial embedded processors.

MAPPING OF COs & POs

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

UNIT-1

INTRODUCTION TOPIC MICROCONTROLLER

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx–- Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT-2

INTERRUPTSAND TIMER

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine - Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variable strings.

UNIT-3

PERIPHERALS

I2C bus for Peripherals Chip Access – Bus Operation - Bus subroutines – Serial EEPROM—Analog to Digital Converter.

UNIT-4

INTERFACING

UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC and Sensor Interfacing.

UNIT-5

INTRODUCTION TO ARM PROCESSOR

ARM Architecture –ARM programmer's model –ARM Development tools- Memory Hierarchy –ARM Assembly Language Programming–Simple Examples–Architectural Support for Operating systems.

UNIT-6

ARM ORGANIZATION

Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TEXT BOOKS:

1. Design with PIC Micro-Controllers by Peatman, J.B, Pearson Education, 2004, 3rd Edition.
2. ARM System on Chip Architecture by Furber. S., Addison Wesley trade Computer Publication, 2000, 2nd Edition.

REFERENCES:

1. PIC Microcontroller by Mazidi, M.A., Rollin Mckinlay, Danny causey Printice Hall of India, 2007.

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(A0229197) ROBOTIC CONTROL SYSTEM

(Professional Elective-III)

COURSE OBJECTIVES:

- To provide knowledge on the various robotic systems with the help of mathematical models.
- To introduce the control aspects of non-linear systems.
- To learn the concepts of non-linear observer design.

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Describe the characteristics of a robotic system from its dynamic model.
- Analyze the stability of robotic systems with the help of theorems.
- Illustrate the various task space control schemes available.
- Discuss about the various Non Linear Control schemes.
- Explain the concepts of Optimal Control System.
- Develop nonlinear observer schemes.

MAPPING OF COs & POs

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

UNIT-1

OVERVIEW OF ROBOTIC SYSTEMS AND THEIR DYNAMICS

Forward and inverse dynamics. Properties of the dynamic model and case studies. Introduction to nonlinear systems and control schemes.

UNIT-2

SYSTEM STABILITY AND TYPES OF STABILITY

Lyapunov stability analysis, both direct and indirect methods. Lemmas and theorems related to stability analysis.

UNIT-3

JOINT SPACE AND TASK SPACE CONTROL SCHEMES

Position control, velocity control, trajectory control and force control.

UNIT-4

NONLINEAR CONTROL SCHEMES

Proportional and derivative control with gravity compensation, computed torque control, sliding mode control, adaptive control, observer based control and robust control.

UNIT-5

OPTIMAL CONTROL

Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application examples.

UNIT-6

NONLINEAR OBSERVER SCHEMES

Design based on acceleration, velocity and position feedback. Numerical simulations using software packages.

TEXT BOOKS:

1. Control of Robot Manipulators in Joint Space by R Kelly, D. Santibanez, LP Victor and Julio Antonio, Springer, 2005.

2. Motion Control Systems by A.Sabanovic and K Ohnishi, John Wiley & Sons (Asia), 2011.

REFERENCE BOOKS:

1. A Mathematical Introduction to Robotic Manipulation by R M Murray, Z. Li and SS Sastry, CRC Press, 1994.
2. Introduction to Robotics: Mechanics and Control by J. J. Craig, Prentice Hall, 2004.
3. Applied Nonlinear Control by J J E Slotine and W Li, Prentice Hall, 1991.
4. Probabilistic Robotics by Sebastian Thrun, Wolfram Burgard, Dieter Fox, MIT Press, 2005.
5. Theory of Robot Control by Carlos, Bruno, Georges Bastin, Springer, 2012.

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(A0230197) FUNDAMENTALS OF ELECTRIC AND HYBRID ELECTRIC VEHICLE

(Professional Elective-IV)

COURSE OBJECTIVES:

- To study the concepts and drive train configurations of electric drive vehicles
- To provide different electric propulsion systems and energy storage devices
- To explain the technology, design methodologies and control strategy of hybrid electric vehicles
- To describe the working principle of electric vehicles.
- To emphasize battery charger topologies for plug in hybrid electric vehicles

COURSE OUTCOMES:

- Understand the concepts and drivetrain configurations of electric drive vehicles
- Interpret different electric propulsion systems and energy storage devices
- Describe about working principle of electric vehicles.
- Appreciate the technology, design methodologies and control strategy of hybrid electric vehicles
- Realize battery charger topologies for plug in hybrid electric vehicles

MAPPING OF COs & POs

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

UNIT-1

Introduction to Electric Vehicles:

EV System – EV Advantages – Vehicle Mechanics – Performance of EVs – Electric Vehicle drivetrain – EV Configurations– EV Market – Types of Electric Vehicle in use Today – Electric Vehicles for the Future.

UNIT-2

Electric Vehicle Modeling:

Tractive Effort in Normal Driving – Energy Consumption-Tractive Effort – Modelling Vehicle Acceleration – Modelling Electric Vehicle Range– EV Motor Sizing

UNIT-3

Design Considerations:

Aerodynamic Considerations-Consideration of Rolling Resistance –Transmission Efficiency– Consideration of Vehicle Mass- General Issues in Design

UNIT-4

Introduction to electric vehicle batteries:

Electric vehicle battery efficiency – electric vehicle battery capacity – electric vehicle battery charging – electric vehicle battery fast charging – electric vehicle battery discharging – electric vehicle battery performance – testing.

UNIT-5

Hybrid Electric Vehicles:

HEV Fundamentals -Architectures of HEVs- Interdisciplinary Nature of HEVs – State of the Art of HEVs – Advantages and Disadvantages – Challenges and Key Technology of HEVs – Concept of Hybridization of the Automobile-Plug-in Hybrid Electric Vehicles – Design and Control Principles of Plug-In Hybrid Electric Vehicles – Fuel Cell Hybrid Electric Drive Train Design – HEV Applications for Military Vehicles.

UNIT-6

Plug-in Hybrid Electric Vehicles:

Introduction to PHEVs, PHEV Architectures, Fuel Economy of PHEVs, Power Management of PHEVs, PHEV Design and Component Sizing, HEV to PHEV Conversions, Vehicle-to-Grid Technology

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell VehiclesFundamentals, Theory and Design by Mehrdad Ehsani, Uimin Gao and Ali Emadi, CRC Press, 2010, 2nd Edition.
2. Electric Vehicle Technology Explained by James Larminie, John Lowry, John Wiley & Sons Ltd, 2003.
3. Electric Vehicle Battery Systems by Sandeep Dhameja, NewnesNew Delhi, 2002.

REFERENCES:

1. Hybrid electric Vehicles Principles and applications with practical perspectives by Chris Mi, Dearborn, M. Abul Masrur, David Wenzhong Gao, John Wiley & Sons, Ltd., 2011.
2. Electric & Hybrid Vehicles Design Fundamentals by Iqbal Hussain, CRC Press, 2011, 2nd Edition.

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(A0231197) POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

(Professional Elective-IV)

COURSE OBJECTIVES:

- To Provide knowledge about the stand alone and grid connected renewable energy systems.
- To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
- To analyze and comprehend the various operating modes of wind electrical generators and solar energy systems.
- To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems.
- To develop maximum power point tracking algorithms.

COURSE OUTCOMES:

After completion of this course, the student will be able to:

- Analyze the impacts of renewable energy generation on environment.
- Understand the importance and qualitative analysis of solar and wind energy sources.
- Apply the principle of operation of electrical machines for wind energy conversion and their performance characteristics.
- Design suitable power converters for solar PV and wind energy systems.

MAPPING OF COs & POs

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

UNIT-1

INTRODUCTION

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT-2

ELECTRICAL MACHINES FOR RENEWABLEENERGY CONVERSION

Reference theory fundamentals-principle of operation and analysis: Induction Generator (IG), Permanent magnet synchronous generator (PMSG), squirrel cage Induction Generator (SCIG) and doubly-fed induction generator (DFIG).

UNIT-3

POWER ELECTRONICS FOR SOLAR ENERGY SYSTEMS

Block diagram of solar photo voltaic system: line commutated converters (inversion-mode) - Boost and buck-boost converters-selection of inverter, battery sizing, array sizing- standalone PV systems - Grid tied and grid interactive inverters- grid connection issues.

UNIT-4

POWER ELECTRONICS FOR WIND ENERGY SYSTEMS

Three phase AC voltage controllers-AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, matrix converters-Stand-alone operation of fixed and variable speed wind energy conversion systems- Grid connection Issues -Grid integrated PMSG and SCIG Based WECS.

UNIT-5

ANALYSIS OF WIND ANDPV SYSTEMS: Stand-alone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT-6

HYBRID RENEWABLE ENERGY SYSTEMS

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TEXT BOOK:

1. Wind Electrical Systems by S. N. Bhadra, D.Kastha, S.Banerjee, Oxford University Press, 2005.
2. Non-conventional Energy sources by B.H.Khan, Tata McGraw-Hill Publishing Company, New Delhi, 2009.

REFERENCES:

1. Wind and Solar Power Systems by Mukund R Patel, CRC Press, 1999, 1st Edition.
2. Wind electrical systems by SN Bhadra, D. Kastha, S. Banerjee, OXFORD higher education, 2018.

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2	1	3

(A0426197) VLSI DESIGN

(Professional Elective-IV)
(For Branches: EEE & ECE)

COURSE OBJECTIVES:

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance trade-offs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

COURSE OUTCOMES:

- Realize the concepts of digital building blocks using MOS transistor.
- Design combinational MOS circuits and power strategies.
- Design and construct Sequential Circuits and Timing systems.
- Design arithmetic building blocks and memory subsystems.
- Apply and implement FPGA design flow and testing.

MAPPING OF COs & POs

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

UNIT-1

MOSTRANSISTOR PRINCIPLE

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT-2

COMBINATIONAL LOGICCIRCUITS

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT-3

SEQUENTIALLOGICCIRCUITS

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT-4

DESIGNING ARITHMETICBUILDINGBLOCKS

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT-5

IMPLEMENTATION STRATEGIES

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

UNIT-6

Testing in VLSI

Defects, Fault Models, Path Sensitization, Scan, Built-in-self Test (BIST), IDDQ

TEXTBOOKS:

1. Digital Integrated Circuits: A Design Perspective by Jan Rabaey, Anantha Chandrakasan, B. Nikolic, Prentice Hall of India, 2003, 2nd Edition.
2. Application Specific Integrated Circuits by M.J. Smith, Addisson Wesley, 1997.

REFERENCES:

1. N.Weste, K. Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E. Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India2005
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall ofIndia, 2007.

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(A0534197) STRUCTURED QUERY LANGUAGE

(Skill Development Course)

COURSE OBJECTIVES:

- Relational Model, Formal Query Languages and SQL basis.
- Storage and efficient retrieval of data: various indexing techniques.
- Schema refinement: normalization and redundancy removal and functional dependant.
- Transaction management: locking protocols, serializability concepts etc.

COURSE OUTCOMES:

- Understand the basic concepts of database and various data model used in database design and ER modelling concepts and architecture.
- Use different integrity constraints in defining database objects
- understand and apply their knowledge in solving procedural and non-procedural language queries
- Create good relational schema by applying normalization methodologies
- Determine the significance of concurrency control mechanism in transaction
- Illustration of various File organization techniques and different storage mediums.

MAPPING OF COs & POs

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

UNIT-1

Features of SQL, DDL (Data Definition Language), Rules for Creating a Table, DML (Data Manipulation Language), Difference between TRUNCATE and DELETE Command, TCL (Transaction Control Language), DCL (Data Control Language).

UNIT-2

Data Types in SQL Server, Types of constraints in SQL Server, To create a Table with Example.

UNIT-3

OPERATORS IN SQL: Assignment operator, Arithmetic operator, Comparison operator, Logical operator, Set operator.

UNIT-4

CLAUSES IN SQL: where, order by, top N clause, group by, having clause, differences between where and having clause, Constraint in SQL.

UNIT-5

Joins In SQL: Equi Join, Inner Join, Outer Join, Left Outer Join, Right Outer Join, Full Outer Join, Non Equi Join, Self-Join, Cross Join, Natural Join.

UNIT-6

Views: Introduction to Views in SQL, Advantages and Disadvantages of Views, Creat Views in SQL, Types of Views, Classifications of Normalization forms in SQL: FIRST, SECOND, THIRD normal forms.

TEXT BOOKS:

1. Database Management Systems, Raghu Ramakrishna, Johannes Gehrke, TATA McGraw Hill, 2017, 3rdEdition.
2. Database System Concepts, Silberschatz, Korth, McGraw hill, 2013, 6th Edition.

REFERENCES:

3. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel, 2016, 11th Edition.
4. Fundamentals of Database Systems by Elmasri Navathe, Pearson Education India,6th Edition, 2013.
5. An Introduction to Database Systems by C.J.Date, Pearson Education India, 7th Edition, 1999.
6. https://www.oreilly.com/library/view/concepts-of-database/9789332537422/xhtml/bibliography.xhtml
7. https://en.wikipedia.org/wiki/Database
8. https://www.sanfoundry.com/best-reference-books-database-management-systems/.

IV-B.Tech., I-Sem (EEE) P C
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(A0285197) POWER SYSTEMS LAB

COURSE OBJECTIVES:

- The knowledge of electrical fault condition is required to deploy proper different protective relays in different locations of electrical equipment.

COURSE OUTCOMES:

- To analyze the experiment results according to relevant theory.
- To Examine protection of Power System with various Protective relays.
- To Review sequence impedances of 3 Phase Alternators and 3 Phase Transformers.
- To understand the principle of Protective Schemes and Various faults in the power system scenario.
- To understand the behavior and characteristics of different equipment's.
- Verification of theoretical concepts through experimentation.

MAPPING OF COs & POs

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

LIST OF EXPERIMENTS:

1. Determination of +ve, -ve and zero sequence impedances of three phase alternator.
2. Determination of +ve, -ve and zero sequence impedances of three phase transformer.
3. Equivalent circuit of a three phase three winding transformer.
4. Fault Analysis(LG, LLG) on a three phase unloaded alternator
5. Fault Analysis(LL, LLLG) on a three phase unloaded alternator
6. Static IDMT over current relay
7. Directional over current relay
8. Inverse over current relay
9. Percentage Differential relay
10. Solid and Liquid Insulation Tests
11. Earth resistance measurement
12. Capacitance grading method

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3 1.5

(A0482197) EMBEDDED CONTROLLERS LAB

COURSE OBJECTIVES:

- To enhance the programming skills of students.
- To drive the students in understanding the instruction sets of 8086, 8051 and TASM.
- To learn the programming for applications such as stepper motor, traffic light controller, LAC and ALC etc.

COURSE OUTCOMES:

- To familiarize with developing of assembly level programs and providing the basics of the processors.
- To provide a theoretical & practical introduction to microcontrollers and microprocessors, assembly language programming techniques.
- To understand programmable peripheral devices and their Interfacing.
- An in-depth knowledge of applying the concepts on real- time applications.
- Becomes skilled in various 8086 Instruction set and Assembler Directives.
- Design of hardware interfacing circuit, using Embedded C for microcontroller and under design considerations.

MAPPING OF COs & POs

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

EXPERIMENTS ON MICROPROCESSOR 8086 KITS:

1. Introduction 8086
2. Arithmetic operations of 8-bit and 16-bit numbers
3. Finding of largest number in a given array
4. Finding of smallest number in a given array
5. Finding out of number of even and odd numbers
6. finding out of number of positive and negative numbers
7. Sum of square of N-numbers
8. Sorting of given numbers
9. Fibonacci series
10. Factorial of a given number
11. Decimal to Hex and Hex to decimal Conversion.

EXPERIMENTS ON COMPUTER SYSTEM:

1. Introduction to TASM
2. Arithmetic operations of 8-bit and numbers-
3. Finding of largest and smallest number in a given array
4. Finding of smallest number in a given array
5. Finding out number of even and odd numbers
6. Finding out number of positive and negative numbers
7. Sorting of given numbers.
8. Binary addition of given two numbers

EXPERIMENTS ON MICROCONTROLLER 8051 KITS:

1. Introduction
2. Arithmetic operations of 8-bit and 16-bit numbers
3. Finding of largest number in a given array
4. Finding of smallest number in a given array

5. ASCII to Decimal conversion
6. Sorting of given numbers.

EMBEDDED 'C' - INTERFACING USING 8051

1. Introduction
2. LED Controlling
3. LCD Interfacing
4. Interfacing with DC Motor and Relays
5. TIMER concepts
6. TIMER as Counter
7. Stepper Motor Interfacing

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(A0232198) UTILIZATION OF ELECTRICAL ENERGY

(Professional Elective-V)

COURSE OBJECTIVES:

- This subject deals with the fundamentals of illumination and its classification and the electric heating and welding.
- It gives the detailed study of all varieties of Electric drives and their application to electrical traction systems

COURSE OUTCOMES:

- Distinguish the difference between AC &DC Motors, their usage & speed control techniques.
- Learn fundamental of ILLUMINATION.
- Study various electrical heating methods.
- Study various electrical welding methods
- Analyze the various concept of electrical traction.
- Evaluate speed-time curve for traction motors.

MAPPING OF COs & POs

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

UNIT-1

ILLUMINATION

Introduction, terms used in illumination, Laws of illumination, Polar curves, Calculation of illumination at a point Numerical Problems, electrical Lamps: Incandescent lamp-carbon arc lamp- Fluorescent lamp-Sodium vapour lamp-mercury vapour lamps-neon lamps and Compact florescent lamps (CFL), advantages of CFL, types of lighting schemes, Requirements of good lighting, Design of street lighting, factory lighting and flood lighting schemes, Numerical Problems.

UNIT-2

ELECTRICAL HEATING

Introduction, applications of electrical heating, Advantages with electrical heating, Methods of Electric heating, Resistance heating, properties of good heating element, design of heating element, arc heating, Induction heating and dielectric heating-applications**.**

UNIT-3

ELECTRIC WELDING

Introduction, Methods of Electric welding, Resistance electric welding, electric arc welding, gas welding, Different welding electrodes-applications

UNIT-4

ELECTRIC TRACTION–I

Introduction, different systems of traction, advantages of electric traction, Systems of track electrification, structure of the ac locomotive, Comparison between A. C and D. C Traction, special features of Traction Motors, electric traction power supply system, overhead equipment of electric traction, tramways, trolley bus.

UNIT-5

ELECTRIC TRACTION–II

Types of railway services, Speed-time curves of different services, simplified speed time curves (trapezoidal and quadrilateral) – Numerical Problems.

UNIT-6

ELECTRIC TRACTION-III

Mechanism of train movement, Tractive effort, Calculations of tractive effort, output Power, energy output, determination of specific energy output, specific energy consumption, factors which effects specific energy consumption, Adhesive weight and coefficient of adhesion – Numerical Problems

TEXT BOOKS:

1. Utilization of Electric power and electric traction –by G.C.Garg. khanna Publishers, 1990.
2. Utilization of Electrical Power – by R. K. Rajput. Laxmi Publications, 2006.

REFERENCE BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 2017.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Co, 2014.

IV-B.Tech., II-Sem (EEE)

L	T	C
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(A0233198) ELEMENTS OF SMART GRID SYSTEM

(Professional Elective-V)

COURSE OBJECTIVES:

- To provide a transparent, sustainable and environmental-friendly power system operation that is cost and energy efficient, secure and safe.

COURSE OUTCOMES:

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

- Understand the features of Smart Grid.
- Assess the role of automation and digitization in Transmission and Distribution.
- Analyze mart grids and Distributed energy resources (DER) with evolutionary algorithms.
- Investigate operation and the importance of data acquisition devices and their location for Voltage and Frequency control.

MAPPING OF COs & POs:

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

UNIT-1

Introduction to Smart Grid

Basics of power systems, definition of smart grid, need for smart grid, smart grid domain, enablers of smart grid, smart grid priority areas, regulatory challenges, and smart-grid activities in India.

UNIT-2

Smart Grid Architecture

Smart grid architecture, standards-policies, smart-grid control layer and elements, network architectures, IP-based systems, power line communications, supervisory control and data acquisition system, advanced metering infrastructure. The fundamental components of Smart Grid designs, Transmission Automation, Distribution Automation, Renewable Integration.

UNIT-3

Tools and Techniques for Smart Grid

Computational Techniques – Static and Dynamic Optimization Techniques for power applications such as Economic load dispatch – Computational Intelligence Techniques – Evolutionary Algorithms in power system – Artificial Intelligence techniques and applications in power system.

UNIT-4

Distribution Generation Technologies

Introduction to Distribution Energy Sources, Renewable Energy Technologies – Micro-grids – Storage Technologies –Electric Vehicles and plug – in hybrids – Environmental impact and Climate Change – Economic Issues.

UNIT-5

Communication Technologies in Smart Grid

Introduction to Communication Technology, Two Way Digital Communications Paradigm, Synchro- Phasor Measurement Units (PMUs) – Wide Area Measurement Systems (WAMS)- Introduction to Internet of things (IoT)- Applications of IoT in Smart Grid.

UNIT-6

Smart-cities: Smart city pilot projects, essential elements of smart cities, active distribution networks, micro-grids, distribution system automation, Reliability and resiliency studies, decentralized operation of power network.

TEXT BOOKS:

1. Smart Grids, Infrastructure, Technology and Solutions, S. Borlase, CRC Press, 2013, 1st Edition.
2. Renewable and Efficient Electric Power System, G. Masters, Wiley–IEEE Press, 2013, 2nd Edition.

REFERENCES:

1. Synchronized Phasor Measurements and their Applications, A.G. Phadke and J.S. Thorp, Springer, 2017, 2nd Edition.
2. Wind Power in Power Systems, T. Ackermann, Hoboken, N J, USA, John Wiley, 2012, 2nd Edition.

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L	T	C
2	1	3

(A0234198) ADVANCED CONTROL SYSTEMS

(Professional Elective-V)

COURSE OBJECTIVE:

- This subject deals with state space, describing function, phase plane and stability analysis including controllability and Observability.
- It also deals with modern control and optimal control systems.

COURSE OUTCOMES:

- To understand how the state space system representation provides an internal description of the system including possible internal oscillations or instabilities.
- To Design Controllability and Observability.
- To derive the describing function for different types of non-linearities and then do the stability analysis.
- To understand how the system design minimizes or maximizes the selected performance index.

MAPPING OF COs & POs

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

UNIT-1

STATE VARIABLE DESCRIPTION

Concept of State – State Equations for Linear Continuous time Models – Non uniqueness of state model – State diagrams for continuous time state models – Solution of state equations – State transmission matrix.

UNIT-2

CONTROLLABILITY AND OBSERVABILITY

Tests for controllability and Observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and Observability of state models in Jordan canonical form and other canonical forms.

UNIT-3

DESCRIBING FUNCTION ANALYSIS

Introduction to nonlinear systems, Types of nonlinearities, Concepts of describing functions, Derivation of describing functions for Dead zone, Saturation, backlash, relay with dead zone and Hysteresis - Jump Resonance.

UNIT-4

PHASE-PLANE ANALYSIS

Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase-plane analysis of nonlinear control systems

UNIT-5

MODAL CONTROL

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement - Full order observer and reduced order observer.

UNIT-6

STABILITY ANALYSIS

Stability in the sense of Lyapunov - Lyapunov's stability and Lypanov's instability theorems direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems

TEXT BOOKS:

1. Modern Control System Theory by M. Gopal, 1993, New Age International Publishers.
2. Advanced Control Theory by A.Nagoor Kani, CBS Publishers & Distributors Pvt. Ltd, 2020, 3rd Edition.

REFERENCE BOOKS:

1. Modern Control Engineering by K. Ogata, Prentice Hall of India, 2009.
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd, 2009.
3. Systems and Control by Stainslaw H. Zak, Oxford Press, 2002.
4. Digital Control and State Variable Methods by M. Gopal, Tata McGraw-Hill Companies, 2008.

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2	1	3

(A0235198) WIND AND SOLAR ENERGY CONVERSION SYSTEMS

(Open Elective-III)

COURSE OUTCOMES:

- To introduce photovoltaic systems, pronounce the solar radiation, measurements and characteristics of solar PV cell.
- To understand in detail photovoltaic energy conversion system.
- Develop the model of a PV system and its applications.
- Understand and analyze the basics of wind power energy
- Analyze the principle of operation of wind generators to have knowledge of design considerations.
- Describe the basic types and mechanical characteristics and model of wind turbine.

MAPPING OF COs & POs

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

UNIT-1

FUNDAMENTALS OF SOLAR CELL

Introduction to PV, world energy scenario – need for sustainable energy sources – current status of Renewable energy sources – Basic characteristics of sunlight – solar spectrum – insolation specifics– irradiance and irradiation-pyrometer, place of photo-voltaic in Energy supply – solar radiation – the sun and earth movement – angle of sunrays on solar collectors – sun tracking – estimating solar radiation empirically – measurement of solar radiation.

UNIT-2

DESIGN OF SOLAR CELLS

Introduction to Solar cells, Solar cell design- design for high I_{SC} – design for high V_{OC} – SC current, open circuit voltage, fill factor, efficiency, losses in solar cells – model of a solar cell, effect of series and shunt resistance on efficiency, effect of solar radiation on efficiency, Analytical techniques. Solar PV cell – I-V characteristics, P-V characteristics.

UNIT-3

SOLAR PHOTOVOLTAIC MODULES

Solar PV Modules from solar cells – series and parallel connection of cells – design and structure of PV modules – number of solar cells in a module, Estimation of and measurement of PV module Power, Selection of PV module.

UNIT-4

FUNDAMENTALS OF WIND ENERGY

Basic principles of wind energy conversions, The nature of the wind, The power in the wind, The forces on the blades, wind energy conversion, wind data and energy estimation, site selection considerations.

UNIT-5

WIND ENERGY CONVERSITION SYSTEMS

Basic components of wind energy conversion systems, classification of wind energy conversation systems, advantages and disadvantages of WEC, applications of wind energy, interconnected systems.

UNIT-6

WIND ENERGY CONVERSION DEVICES (MACHINES OR TURBINES)

Introduction, Horizontal axial Machines – Dutch-type grain-grinding wind mills, Multi blade water pumping wind mills and High speed propeller type wind mills. Vertical axial machines – The savonius rotor, The derrieus rotor.

TEXT BOOKS:

1. Solar Photovoltaic Technology and Systems by Chetan Singh Solanki, PHI Learning Pvt. Ltd., 2013.
2. Wind Electrical systems by S.N Bhadra, D.Kastha, S.Banerjee. OUP India, 2005.
3. Non – conventional Energy sources by G.D RAI. Khanna Publishers, 2009.

REFERENCE BOOKS:

1. Wind and solar power systems by Mukund R.Patel, CRC Press, 1999, 1st Edition.
2. Solar Energy fundamentals and modeling techniques, Springer, 2008, 1st Edition.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems. John Wiley & Sons, 2004

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L	T	C
2	1	3

(A0236198) SPECIAL MACHINES

(Open Elective-III)

COURSE OBJECTIVES:

- This subject deals with the construction, working and characteristics of special machines

COURSE OUTCOMES:

- To know the Basics of various special machines
- To understand the operation and working of machines
- To study the characteristics of machines
- To study the applications related to industries
- To realize the machines in conjunction with Microcontrollers

MAPPING OF COs & POs

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

UNIT-1

SPECIAL TYPES OF D. C. MACHINES

Series – Shunt – Reversible – Non-Reversible boosters - Armature excited machines– Rosenberg generator–Third-brush generator – Three-wire generator - Dynamometer.

UNIT-2

STEPPER MOTORS

Introduction –Construction, Principle of Operation, Energisation with two phase at a time, Essential conditions for the satisfactory Operation of a 2-Phase Hybrid Stepper Motor– Control Circuits for Stepping Motors – An Open Loop Controller for a 2-Phase Stepping Motor.

UNIT-3

VARIABLE RELUCTANCE STEPPING MOTORS

Introduction-Construction, Operating Principle, Single–Stack VR step motors, Multiple-stack VR motors–Open Loop Control of 3-Phase VR Step Motor, Closed-Loop Control of Step Motor–Areas of Application of Stepping Motors–Torque developed in the Step Motor.

UNIT-4

SWITCHED RELUCTANCE MOTOR

Introduction – Principle of Operation of SRM, Some Distinctive Differences between SR and Conventional Reluctance Motors –Design of stator and Rotor and pole Arcs in SRM – Power Converter for SRM – Derivation of Torque Expression.

UNIT-5

BRUSHLESS DC MOTOR

Types of Construction – Principle of Operation of BLDCM – Sensing and Switching Logic Scheme–Theory of BLDCM as Variable Speed Synchronous Motor (Assuming Sinusoidal Flux Distribution) – Methods of reducing Torque Pulsations, 180^0 Pole Arc and 120^0 current sheet.

UNIT-6

PERMANENT MAGNET MATERIALS AND MOTORS

Introduction – Stator Frames (Pole – and Yoke – Part) of Conventional PM DC Motors, Equivalent circuit of a PM – Development of Electronically Commutated DC Motor from Conventional DC Motor. Development of a Double sided LIM from Rotary type IM–A

Schematic of LIM Drive for Electric Traction – Development of one sided LIM with back Iron.

TEXT BOOKS:

1. Special Electrical Machines by K. Venkataratnam, University Press, 2009, 1st Edition.
2. Electrical machines by R. K. Rajput, Laxmi Publications, 2008, 1st Edition.

REFERENCE BOOKS:

1. D. C. Machines by M. G. Say & E. O. Taylor, Pitman Publishing, 1980.
2. Stepper Motors: Fundamentals, Applications and Designby V. V. Athani, New Age International Pub, 1997.

RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IV-B.Tech., II-Sem (EEE)

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(A0418196) DIGITAL SIGNAL PROCESSING

(Open Elective-III)
(For Branches: EEE & ECE)

COURSE OBJECTIVES:

- Enhance the analytical ability of the students in facing the challenges posed by growing trends in communication, control and signal processing areas.
- Develop ability among students for problem formulation, system design and solving skills
- Understand Various Discrete-time signals and class of linear shift-invariant systems will be studied using the convolution sum, and the frequency domain, using transformations.

COURSE OUTCOMES:

- Represent of DT signals analytically & Visualize them in the Time domain.
- Ready to utilize FT.
- To implement DFT's using FFT.
- To determine and implement the appropriate type of design method for FIR filters.
- Choose appropriate decimation and interpolation factors for high performance filters

MAPPING OF COs & POs

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

UNIT-1

INTRODUCTION

Review of Discrete Time Signals and Sequences, Frequency domain representation of Discrete Time Signals and Systems, DTFT. Discrete Fourier series: Properties of Discrete Fourier Series, DFS representation of periodic sequences. Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT. Review of Z-Transforms, applications of Z-Transforms, Relation between Z-Transform and DFS.

UNIT-2

FAST FOURIER TRANSFORMS

Radix-2 Fast Fourier Transforms (FFT), Decimation in Time and Decimation in Frequency FFT Algorithms, Inverse FFT.

UNIT-3

REALIZATION OF DIGITAL FILTERS

Solution of Difference Equations of Digital Filters, Block Diagram Representation of Linear Constant Coefficient Difference Equations, Basic structures of IIR systems: Direct form-I realization, Direct form-II realization, Cascade form realization, Parallel form realization, Basic structures of FIR systems: Direct form realization, Cascade form realization, Lattice structures of IIR systems, Lattice structures of FIR systems. Conversion from Lattice structure to direct form, Conversion from direct from to Lattice structure, Lattice-ladder structure.

UNIT-4

IIR DIGITAL FILTERS

Analog filter approximations Butterworth and Chebyshev, Design of IIR digital filters from analog filters, Design examples, Frequency Transformations in Analog Domain and Frequency Transformations in digital domain, Illustrative Problems.

UNIT-5

FIR DIGITAL FILTERS

Characteristics of FIR Digital Filters, Frequency Response - Design of FIR Digital Filters Using Window Techniques, Frequency Sampling Technique, Comparison of IIR and FIR filters, Illustrative Problems

UNIT-6

MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS

Basic Sampling Rate Alteration Devices, Multirate Structures for Sampling Rate Converters, Multistage Design of Decimator and Interpolator, Poly-Phase Decomposition. Applications of DSP: Spectral analysis of non-stationary Signals, Trans multiplexers

TEXT BOOKS:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education India, 2007, 7th Edition.
2. Digital signal processing, A computer base approach by Sanjit K Mitra, Tata Mcgraw Hill, 2009, 3rdEdition.
3. Discrete Time Signal Processing by A.V.Oppenheim and R.W. Schaffer, PHI, 2nd Edition.

REFERENCES:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publishing House Pvt. Ltd, 2009.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

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L	T	C
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(A0025198) GROUP DISCUSSION AND MOCK INTERVIEW

(Skill Development Course)

COURSE OBJECTIVES:

- To make the students aware of the GD session in selection process
- To learn the art of presentation and organizing meetings
- To learn about the benefits of team work at the work place
- To learn the process of interviews an also extempore sessions
- To motivate the students with the help of popular motivational stories

COURSE OUTCOMES:

- The students can develop good leadership skills, communication skills, good interpersonal skill, analytical and lateral thinking
- To apply the principles of a good presentation and develop the art of presenting effectively
- The student can be a good team player by learning about the advantages of team building
- The student would be able to perform well in interviews and extempore sessions
- The student also learns the importance of developing self-motivation by being influenced by successful stories

MAPPING OF COs & POs

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

UNIT-1

GROUP DISCUSSION: Introduction-Types of GD-D topics-Do's and Don'ts in GD -GD Tips-Difference between GD and Debate-Mock GD's and Debate - Role Play in a Group Discussion

UNIT-2

PRESENTATION SKILLS: Presentation Evaluation-Just a minute speeches-Creating a power point presentation-Body language –Conclusions-Planning a meeting-Analyzing a meeting-Analyzing agendas-Round table discussions-Small group presentation - Shaking hands - Logging silences - Talent search - To speak or not to speak - relationships.

UNIT-3

TEAM WORK SKILLS: Dimensions of team building - Components of team building - Purpose of teams - Building blocks for team - Types of team - Team leader skills

UNIT-4

INTERVIEW SKILLS: Introduction – concept – Types of Interviews – Characteristics of Interviewer – Characteristics of Interviewee – Recruitment interview – Appraisal interview – Research interview.

UNIT-5

EXTEMPORE: Introduction to Extempore - Common Extempore Topics–SWOT Analysis

UNIT-6

MOTIVATIONAL THEMES: How to Win Friends and Influence People by Dale Carnegie, The Go-Giver: A little story about a powerful Business idea by Bob Burg and John David Mann, how to talk to anyone – 92 little tricks for big success in relationship by Leil Lowndes.

REFERENCE BOOKS:

1. How to win Friends and influence people by Dale Carnegie, Published 1998 by Gallery Books.
2. The Go-Giver: A little story about a powerful Business idea by Bob Burg and John David Mann, December 27, 2007.
3. How to talk to anyone – 92 little tricks for big success in relationship by Leil Lowndes, 2014.