ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

For
B.TECH FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2014-15)

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(Affliated to JNTU, Accredited by NAAC with "A" grade)
Kandlakoya, Medchal Road, Hyderabad.

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institute)

ACADEMIC REGULATIONS FOR B.TECH DEGREE COURSE
(Applicable for Students admitted from the academic year 2014-2015)

1. Award of B.Tech. Degree

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

1.1. The student shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2. After eight academic years of course of study, a student may be permitted to write the examinations for two more years.

1.3. The student shall register for 224 credits and secure all 224 credits The candidate shall also complete the non-credit courses as per the syllabus.

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

2. Courses of study

The following courses of study are offered at present for specialization for the B. Tech. Course:

Branch Code	Branch
01	Civil Engineering.
02	Electrical & Electronics Engineering
03	Mechanical Engineering
04	Electronics & Communication Engineering
05	Computer Science & Engineering.

2.1**. Eligibility criteria for admission**

The eligibility criteria for admission into engineering courses by regular and lateral entry scheme students shall be as stipulated by the state government from time to time.

2.2. **Medium of instruction**

The medium of instruction and examinations for all courses is English.

3. Distribution and weightage of marks

3.1. The performance of a student in each semester shall be evaluated subject – wise with **a** maximum of 100 marks for theory and 75 marks for practical subjects. In addition, an Industry oriented mini-project, Seminar, Comprehensive viva-voce, and Project Work shall be evaluated for 50, 50, 100 and 200 marks respectively.

3.2. For Theory subjects, during a semester there shall be two internal examinations. Each internal examination consists of one objective paper, one essay paper and one assignment. The objective type paper shall be for 10 marks, essay type paper shall be for 15 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The objective paper is set with 10 short answer questions of one mark each. The essay paper shall contain 5 full questions (2 questions each from fully completed Units and 1 question from partially completed Unit) out of which, the student has to answer 3 questions, each carrying 5 marks. While the first internal examination shall be conducted from 1 to 2.5 units of the syllabus, the second internal examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first internal examination and second Assignment should be submitted before the conduct of the second internal examination. The total marks secured by the student in each internal examination are evaluated for 30 marks. The final marks secured in internal evaluation by each candidate are arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination. A student who is absent from any assignment/ internal examination for any reason what so ever shall be deemed to have secured 'zero' marks in the test/ examination and no makeup test/ examination shall be conducted.

3.3. For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of 25 marks of internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner from other institutions or industry shall be appointed by the Controller of Examinations in consultation with Head of the Department.

3.4. For the subjects having design and / or drawing, (such as Engineering Graphics, AutoCAD, Engineering Drawing, Machine Drawing and Estimation etc.,) the internal evaluation carries 30 marks (the distribution is 15 marks for day-to-day work and 15 marks for internal examination) and 70 marks shall be for end semester examination. There shall be two internal examinations in a semester. The final marks secured by each candidate in the internal evaluation is arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination.

3.5. There shall be an industry-oriented mini-Project, in collaboration with an industry of their specialization, to be taken up during the summer vacation after VI Semester examination. The mini project shall be evaluated during the VIII Semester. The industry oriented mini project shall be submitted in a report form and should be presented before a committee, which shall be evaluated for 50 marks. The committee consists of Head of the Department, the supervisor of mini project, a senior faculty member of the department and an external examiner. There shall be no internal marks for industry-oriented mini-project. The external examiner from other institutions or industry shall be appointed by the Controller of Examinations in consultation with Head of the Department.

3.6. There shall be a Seminar presentation in VIII Semester. For the Seminar, the student shall collect the information on a specialized topic other than the project topic and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Seminar supervisor and a senior faculty member from the department. The seminar will be evaluated for 50 marks. There

shall be no internal marks for the seminar.

3.7. There shall be a Comprehensive Viva-Voce in VIII Semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of the Head of the Department and three Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding in various subjects he studied during the B.Tech. course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There shall be no internal marks for the Comprehensive Viva-Voce.

3.8. The **project work** shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for end-semester evaluation. The project work shall be taken up in the beginning of VIII semester and shall be completed by the end of VIII semester. Internal evaluation shall be conducted by Head of the Department and the project supervisor for 60 marks. The end semester examination shall be based on the report submitted and a viva-voce exam for 140 marks by committee comprising of the Head of the Department, project supervisor and an external examiner. The external examiner shall be appointed by the Controller of Examinations from a panel of three members submitted by the Head of the Department.

4. Semester end Examination

4.1. Theory Courses

The end semester examination will be conducted for 70 marks which consists of Part-A and Part-B. The examination is of 3 hours duration. Question paper pattern is as follows

Part-A: 20 Marks
There shall be 10 questions each carrying 2 Marks. (Two questions from each Unit)

Part-B: 50 Marks
There shall be 10 questions out of which 5 questions (Internal choice within a unit i.e. two questions from each unit out of which one question from each unit to be answered) are to be answered, each question carry 10 marks.

4.2. Practical Courses

Each lab course is evaluated for 50 marks. The examination shall be conducted by the laboratory teacher. One examiner will be appointed by the Controller of Examinations from other institutions or industry in consultation with HOD.

4.3. Supplementary Examinations

The schedule for supplementary examinations shall be as notified by the institute from time to time.

5. Attendance Requirements

5.1. A student shall be eligible to appear for the Semester end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects for Semester.

5.2. 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. A student will not be permitted to write the end examination and not promoted to the next Semester unless

he satisfies the attendance requirement of the present semester, as applicable.

5.3. Shortage of Attendance **below 65% in aggregate** shall in **No case be condoned.**

5.4 Students whose shortage of attendance is not condoned in any Semester are not eligible to take their end semester examination of that semester.

5.5. A stipulated fee shall be payable towards condonation of shortage of attendance.

5.6. A student who is short of attendance in a semester may seek re-admission into that semester when offered next within 4 weeks from the date of the commencement of class work.

5.7. A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester including the days of attendance in sports, games, NCC and NSS activities. The consideration of attendance in such activities is restricted to a maximum of 15 instructional days in a semester. Prior permission of the Head of the Department in writing shall be obtained by the students to avail the attendance from above mentioned activities.

6. Minimum Academic Requirements

The following academic requirements have to be satisfied in addition to the attendance requirement mentions in item No.5.

6.1 A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/ practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the internal and end semester examinations. A student shall obtain 40% of the marks in case of external evaluation alone.

6.2 Promotion of the student from first year to second year is not based on the credits secured and is subject to meeting the attendance criterion as specified in item No. 5

6.3 A student shall be promoted from II year to III year only if he fulfils the academic requirement of 34 credits up to III semester from all the examinations, whether or not the candidate takes the examination and secures prescribed minimum attendance in IV semester.

6.4 A Student shall be promoted from III year to IV year only if he fulfils the academic requirement of 56 credits up to V semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in VI semester.

6.5 A student shall register and put up minimum attendance in all 224 credits.

6.6. In addition to the above 224 credits the student must complete the non credit courses. The non-credit courses awarded with a grade of satisfactory or not satisfactory based on meeting the minimum attendance requirement by the student.

6.7. Students who fail to earn 224 credits as indicated in the course structure within ten academic years (8 year of study +2 years additionally for appearing for exams) from the year of their admission shall forfeit their seat in B.Tech. course and their admission stands cancelled.

7. Course pattern

7.1. The entire course of study is for four academic years and on semester pattern.

7.2. A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject during the period of supplementary exams.

7.3. When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester when offered next. However, the academic regulations under which he was first admitted shall be applicable to him. After the revision of the

regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

8. Award 0f Class:

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

Class Awarded	**% of marks to be secured**
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

9. Minimum Instruction Days

9.1. The minimum instruction days for each semester shall be 90**.**

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

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

10. Withholding of Results

If the student has not paid dues to College, or if any case of indiscipline is pending against him, the result of the candidate may be withheld and he will not be allowed into the next semester. The award of the degree will be withheld in such cases.

11. Transitory Regulations

11.1. Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.

11.2. After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

11.3. In case of transferred students from other Universities, the credits shall be transferred to as per the academic regulations and course structure of the college.

12. General

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

12.2. The academic regulation should be read as a whole for the purpose of any interpretation

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

12.4. The Academic Council 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 college.

12.5. The students seeking transfer to colleges affiliated to JNTUH from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of college, and also pass the subjects of college which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of college, the candidates have to study those subjects in college in spite of the that those subjects are repeated.

Academic Regulations R1 For B. Tech. (Lateral Entry Scheme)

Applicable for the students admitted into II year B.Tech. (LES) from the Academic Year 2015-2016 and onwards

1 Eligibility for award of B.Tech. Degree (LES)

1.1. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

1.2. After six academic years of course of study, a lateral entry student may be permitted to write the examinations for two more years.

1.3. The candidates shall register for 168 credits and secure all 168 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech.

1.4. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years only for appearing in the exams) from the year of admission, shall forfeit their seats.

1.5. The attendance regulations of B.Tech. (Regular) shall be applicable to B.Tech. (LES)

2. Promotion Rule

2.1. Promotion of the student from second year to third year is not based on the credits secured and is subject to meeting the attendance criterion as specified in item No. 1.5

2.2. A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 34 credits up to V semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in VI semester.

3. Award of Class:

Method of awarding class shall be same that of the regular entry students.

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

5. General

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

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

iii. In the case of any discrepancy/ambiguity/doubt arises in the above rules and regulations, the decision of the College Academic Council shall be final.

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

MALPRACTICES RULES
DISCIPLINARY ACTION FOR
IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/ Improper conduct	Punishment
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the Remaining subjects of that semester/year. The candidate

		is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks	Cancellation of the performance in that subject
6.	Refuses to obey the orders of the Chief Superintendent/Assistant– Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the college or organizes a walk out or instigates others **to** examination hall walk out, or threatens the officer- in-charge or any person on duty in or outside the examination hall of any injury**,** to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If the student belongs to the college, expulsion from the examination hall an cancellation of performance in that subject and all other subjects hall and all other subjects that candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police

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

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

The following procedure is to be followed in case of malpractice cases detected during valuation, scrutiny etc. at spot center.

1) Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
2) A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.
3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.
4) Based on the explanation and recommendation of the committee, action may be initiated.

5) Malpractice committee:

i. Controller of Examinations — Chairman
ii. Assistant controller of Evaluation — Member
iii. Chief Examiner of the subject/ subject expert — Member
iv. Concerned Head of the Department — Member
v. Concerned Invigilator — Member

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I SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1001	H & S	English -I	2	0	0	2	30	70
2	A1006	H & S	Linear Algebra & Calculus	4	1	0	4	30	70
3	A1013	H & S	Engineering Physics-I	4	0	0	4	30	70
4	A1016	H & S	Engineering Chemistry	4	0	0	4	30	70
5	A1501	CSE	Computer Programming through 'C'	4	1	0	4	30	70
6	A1306	MECH	Engineering Drawing	3	0	3	4	30	70
7	A1542	CSE	Computer Programming Lab	0	0	3	2	25	50
8	A1015	H & S	Engineering Physics Lab	0	0	3	2	25	50
9	A1303	MECH	Engineering workshop	0	0	3	2	25	50
			Total	21	2	12	28		

II SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1002	H & S	English - II	2	0	0	2	30	70
2	A1007	H & S	Advanced Calculus	4	1	0	4	30	70
3	A1008	H & S	Mathematical Methods	4	1	0	4	30	70
4	A1014	H & S	Engineering Physics-II	3	0	0	3	30	70
5	A1017	H & S	Advanced Engineering Chemistry	3	0	0	3	30	70
6	A1502	CSE	Data Structures through 'C'	4	1	0	4	30	70
7	A1543	CSE	Data Structures Lab	0	0	3	2	25	50
8	A1019	H & S	Engineering Chemistry Lab	0	0	3	2	25	50
9	A1003	H & S	English Language Communication Skills Lab	0	0	3	2	25	50
10	A1544	CSE	IT Workshop	0	0	3	2	25	50
			Total	20	3	12	28		

III SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1009	H & S	Special Functions & Complex Analysis	4	1	0	4	30	70
2	A1201	EEE	Network Theory-I	4	1	0	4	30	70
3	A1202	EEE	Electromagnetic Fields	4	1	0	4	30	70
4	A1313	MECH	Fluid Mechanics & Hydraulic Machinery	4	1	0	4	30	70
5	A1401	ECE	Electronic Devices & Circuits	4	1	0	4	30	70
6	A1203	EEE	Electrical Machines-I	4	1	0	4	30	70
7	A1317	MECH	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	2	25	50
8	A1405	ECE	Electronic Devices & Circuits Lab	0	0	3	2	25	50
			Total	24	6	6	28		

IV SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1208	EEE	Power Systems-I	4	1	0	4	30	70
2	A1209	EEE	Electrical Machines-II	4	1	0	4	30	70
3	A1210	EEE	Network Theory-II	4	1	0	4	30	70
4	A1404	ECE	Switching Theory & Logic Design	4	1	0	4	30	70
5	A1442	ECE	Electronic Circuits	4	1	0	4	30	70
6	A1218	EEE	Control Systems	4	1	0	4	30	70
7	A1211	EEE	Electrical Machines Lab -I	0	0	3	2	25	50
8	A1212	EEE	Electrical Circuits &Simulation Lab	0	0	3	2	25	50
9	A1005	H & S	**Soft Skills and Professional Ethics**	2	0	0	0		
			Total	26	6	6	28		

V SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1217	EEE	Power Systems-II	4	1	0	4	30	70
2	A1021	H & S	Managerial Economics & Financial Analysis	4	0	0	4	30	70
3	A1219	EEE	Electrical Measurements & Instrumentation	4	0	0	4	30	70
4	A1414	ECE	Linear and Digital IC Applications	4	0	0	4	30	70
5	A1220	EEE	Power Electronics	4	1	0	4	30	70
6	A1221	EEE	Electrical Machines-III	4	1	0	4	30	70
7	A1222	EEE	Electrical Machines Lab– II	0	0	3	2	25	50
8	A1223	EEE	Control Systems &Simulation Lab	0	0	3	2	25	50
9	A1011	H & S	Analytical Skills-1	2	0	0	0		
			Total	26	3	6	28		

VI SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1224	EEE	Power Semiconductor Drives	4	1	0	4	30	70
2	A1020	H & S	Environmental Studies	4	0	0	4	30	70
3	A1226	EEE	Power Systems-III	4	1	0	4	30	70
4	A1227	EEE	Computer Methods in Power Systems	4	1	0	4	30	70
5	A1420	ECE	Digital Signal Processing	4	1	0	4	30	70
6	**OE**		**OPEN ELECTIVE**	4	1	0	4	30	70
	A1510	CSE	Object Oriented Programming through JAVA						
	A1509	CSE	Data Base Management Systems						
	A1505	CSE	Computer Organization						
7	A1004	H & S	Advanced English Communication Skills Lab	0	0	3	2	25	50
8	A1228	EEE	Power Electronics &Simulation Lab	0	0	3	2	25	50
9	A1012	H & S	Analytical Skills – II	2	0	0	0		
			Total	26	5	6	28		

VII SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1229	EEE	Utilization of Electrical Energy	4	1	0	4	30	70
2	A1225	EEE	Power System Operation & Control	4	0	0	4	30	70
3	A1411	ECE	Microprocessors & Microcontrollers	4	1	0	4	30	70
4	A1022	H & S	Management Science	4	0	0	4	30	70
5	A1230	EEE	Renewable Energy Sources	4	1	0	4	30	70
6	**DE-I**		**DEPARTMENTAL ELECTIVE – I**	4	1	0	4	30	70
	A1231	EEE	Electrical Distribution Systems						
	A1232	EEE	Advanced Control Systems						
	A1233	EEE	Solar Photo Voltaic Systems						
7	A1417	ECE	Microprocessors & Microcontrollers Lab	0	0	3	2	25	50
8	A1234	EEE	Electrical Measurements Lab	0	0	3	2	25	50
			Total	24	4	6	28		

VIII SEMESTER

S.No	CODE	BRANCH	SUBJECT	L	T	P	C	Internal Marks	External Marks
1	A1236	EEE	Fundamentals of HVDC Transmission & FACTS	4	1	0	4	30	70
2	**DE-II**		**DEPARTMENTAL ELECTIVE – II**	4	1	0	4	30	70
	A1237	EEE	High Voltage Engineering						
	A1238	EEE	Nanotechnology						
	A1239	EEE	Digital Control Systems						
3	**DE-III**		**DEPARTMENTAL ELECTIVE – III**	4	1	0	4	30	70
	A1204	EEE	Extra High Voltage AC Transmission						
	A1205	EEE	Linear Systems Analysis						
	A1207	EEE	Reliability Engineering						
4	A1240	EEE	Comprehensive Viva	0	0	0	2	-	100
5	A1241	EEE	Industry Oriented Mini Project	0	0	0	2	-	50
6	A1242	EEE	Seminar	0	0	3	2	-	50
7	A1243	EEE	Main Project	0	10	0	10	60	140
			Total	12	13	3	28		

Note: All End Examinations (Theory & Practical) are of three hours duration.

T – Tutorial L – Theory P – Practical C – Credits

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(A1001)ENGLISH-I

GENERAL OBJECTIVES:

- To improve the language proficiency of the students in English with emphasis on **LSRW**skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

SKILLS-WISE OBJECTIVES:

Listening Skills:

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

Speaking Skills:

- To make students aware of the role of speaking in English and its contribution to their success.
- To enable students to express themselves fluently and appropriately in social and professional contexts.

Reading Skills:

- To develop an awareness in the students about the significance of silent reading and comprehension.
- To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

Writing Skills:

- To develop an awareness in the students about writing as an exact and formal skill
- To equip them with the components of different forms of writing, beginning with paragraph writing.

Unit –I:

- Chapter entitled 'Wit and Humour' from 'Skills Annexe' -Functional English to Success Published by Orient Black Swan, Hyderabad. **A Tea Party**
  - L-Listening For Sounds, Stress and Intonation
  - S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
  - R- Reading for Subject/ Theme
  - W- Writing Paragraphs
  - G-Types of Nouns and Pronouns
  - V- Homonyms, homophones synonyms, antonyms

Unit –II

- Chapter entitled 'MokshagundamVisvesvaraya' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad.
  - L-Conversations – Introducing each other, Talking about a course.
  - S- Opinion based questions
  - R- Reading for Subject/ Theme - The Palm island
  - W- Writing Paragraphs
  - G- Joining ideas by conjunctions, Adverbs
  - V- Prefixes and suffixes

Unit –III

- Chapter entitled "Cyber Age" from "Skills Annexe -Functional English for Success" Published by Orient Black Swan, Hyderabad.
  - L – Listening for themes and facts
  - S – Apologizing, interrupting, requesting and making polite conversation
  - R- for theme and gist
  - W- Describing people, places, objects, events
  - G- Verb forms
  - V- noun, verb, adjective and adverb

Unit –IV

- Chapter entitled 'Three days To See' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad.
    - L – Conversations – Planning for an outing
    - S – Debate
    - R- 'Physically challenged athletes
    - W- Report writing
    - G- Expressing yourself with modal auxiliary verbs
    - V- Collective nouns – Synonyms, Prefixes

Unit –V

- Chapter entitled 'The Last Leaf' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad
    - L -Listening for specific details - 'Speech on Environmental conservation'
    - S- Group Discussions - narrating, expressing opinions
    - R –Choose how to start your day
    - W- Writing a Précis
    - G- Relating objects by using prepositions, Ergative verbs
    - V- Vocabulary - idioms

Course outcomes

By the end of the course students will be able to:

- Realize why humour and wit are important in our daily lives and share their anecdotes
- Read and appreciate how scientific inventions have transformed our lives.
- Debate on the issue of preferring to serve their country or go abroad to serve foreign countries.
- Write coherently about the role of visvesvaraya as a true patriot and as an excellent engineer in solving complex, social problems.
- Apologize, interrupt, request and make polite conversation using appropriate language.

TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following text books and course content,are prescribed:

1. A Text book entitled **"Skills Annexe", -Functional English to Success** Published by Orient Black Swan, Hyderabad
2. A text book entitled, **"Epitome of Wisdom",** Published by Maruthi Publications, Hyderabad.

REFERENCES:

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishnaRao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata McGraw –Hill.
7. Spoken English, R.K. Bansal&JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe &Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe &Showick Thorpe, Pearson Education
15. Effective Technical Communication, M Ashraf Rizvi, Tata McGraw –Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and HemlathaNagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publisher

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(A1006)LINEAR ALGEBRA & CALCULUS

Objectives :

- Obtain and understand formation and solution of matrices. Solutions of linear systems through matrices.
- Learn to find Eigen values, Eigen vectors and usage of Cayley-Hamilton Theorem. Understanding real & complex matrices and reduction to Canonical form.
- A through treatment of sequences and series.
- Develop the skills pertinent to the practice of mathematics (including the students) to formulate problems. (A treatment of limits) including all standard theorems about continuous and differentiable functions. Define nano materials and their preparation along with applications.
- Identify major characteristics of graphs and relate them to first and second derivatives. Find areas of bounded regions can be found using methods of integrations.

Unit-I: Linear Algebra-I
Matrices and Linear Systems of Equations: Real matrices :- Symmetric, Skew-symmetric, Orthogonal, Linear Transformation- Orthogonal Transformation. Complex matrices: Hermitian, Skew- Hermitian and Unitary. Elementary row transformations- Rank – Echelon form, Normal form- Solution of Linear Systems – Direct Methods (Gauss Elimination, Gauss Jordan)-LU-Decomposition.

Unit-II: Linear Algebra-II
Eigen Values, Eigen Vectors- Properties, Cayley –Hamilton Theorem(without proof) – Inverse and Powers of a matrix by cayley-Hamilton theorem- Diagonolization of matrix.Calculation of Powers of matrix-Modal and spectral matrices. Quadratic forms- Reduction of quadratic form to canonical form-rank- positive , Negative definite-semi definite-Index-Signature.

Unit-III: Sequences – Series
Basic definitions of Sequences and Series- Convergence and divergence – Comparison test- Ratio test – Integral test- Cauchy's root test- Raabe's Test – Absolute and Conditional Convergence .

Unit-IV: Functions of Single& Several Variables
Rolle's theorem –Lagrange's Mean value Theorem – Cauchy's Mean value theorem- Generalized Mean value theorem(all theorems without proof)
Functions of Several Variables- Functional dependence –Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints.

Unit-V: Applications of Single Variable & Multiple Integrals
Radius, Centre and Circle of Curvature- Evolutes and Envelopes.
Multiple integrals – double integral – Change of variables – Change of order of integration and Triple integrals.

TEXT BOOKS

1. Kreyszig's Engineering Mathematics – I by Dr. A. Ramakrishna Prasad,2014yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS

1. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
2. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
5. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2013 Yr. EditionS.Chand.
6. Engineering Mathematics – I by D.S. Chandrasekhar, Prison Books Pvt. Ltd.
7. Engineering Mathematics – I by G. Shanker Rao& Others I.K. International Publications.

Course Outcomes

- The students be able to solve linear system by using various methods of matrices.
- The students be able to find eigenvalues ,eigen vectors and diagnalization of a square matrix. Finding the nature of real and complex matrices by reducing to Canonical form.
- The students be able to determine when a series converges both from definition and the Cauchy criterion. Be able to use the standard convergence tests for series to determine if a particular series convergence.
- The students be able to verify mean value theorems and they can find maximum and minimum for multiple variable functions.
- The students be able to calculate the volumes solid objects, the length of arcs and the surface area; perform polar-to-rectangular and rectangular-to-polar conversions.

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(A1013)ENGINEERING PHYSICS-I

Objectives:

- To understand the phenomenon of interference, diffraction and polarization of light.
- To understand the bonding and structural properties of the crystals and their study using X-ray diffraction techniques.
- To understand the origin of different crystal defects and the basics of statistical mechanics.
- To understand the classical, quantum approach to explain the electrical properties of solids and also band theory of solids.
- To understand the properties of semi-conductors materials.

UNIT-I

Optics: Interference: Introduction, interference in thin films (reflected light), Newton rings.

Diffraction: Introduction, Fraunhofer diffraction due to single slit, double slit and N-slits, Diffraction grating experiment, Rayleigh criterion and resolving power of grating.

Polarisation: introduction, Malus law, Brewster,s law, double refraction, construction and working of Nicol's prism, polaroids, quarter wave and half wave plates.

UNIT-II

Crystallography: Ionic bond, covalent bond, metallic bond, hydrogen bond, Vander-Waal's bond, calculation of cohesive energy ionic crystal, space Lattice, unit cell, lattice parameters, seven crystal system, Bravais lattices, atomic radius, co-ordination number and packing factors of SC, BCC, FCC structures, Structures of CsCl, NaCl and Diamond.

Crystal planes and directions, Miller indices, inter planar spacing of orthogonal crystal

X-ray Diffraction: Bragg's law, X- ray diffraction methods: powder method, applications of X- ray diffraction;

UNIT-III

Defects in Solids Point defects: vacancies, substitutional impurities, interstitial impurities, Frenkel and Schottky defects; qualitative treatment of line defects(Edge and Screw dislocations), Burger's vector, surface defects.

Statistical Mechanics Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac statistics (qualitative treatment), concept of electron gas, density of states, Fermi distribution function - the effect of temperature on the distribution and Fermi energy.

UNIT-IV

Principles of Quantum Mechanics: Waves and particles, de-Broglie Hypothesis, matter waves, Davisson and Germer's experiment, G.P. Thomson experiment, Heisenberg's uncertainty principle, Schrödinger's time independent wave equation - physical significance of the wave function – infinite square well potential.

Band Theory of Solids: Assumptions of classical and quantum free electron theory of metals and their limitations,origin of energy band formation in solids, electron in a periodic potential: Bloch theorem, Kronig- Penny model (qualitative treatment), E-K curve, concept of effective mass of an electron, classification of materials into conductors, semiconductors & insulators.

UNIT-V

Semiconductor Physics: Introduction, Fermi level in intrinsic and extrinsic semiconductors, calculation of carrier concentration in intrinsic and extrinsic semiconductors, direct & indirect band gap semiconductors, Hall effect.

Physics of Semiconductor Devices: Formation of PN junction, open circuit pn junction, energy diagram of PN diode, diode equation, I-V Characteristics of PN junction diode, LED photo diode and solar cell.

TEXT BOOKS

1. Engineering Physics by PK PalaniSamy, ScitechPublications.
2. Applied Physics for Engineers by Dr.P.MadhusudanaRao, Academic Publishing Company.
3. Solid State Physics by S.O.Pillai (Main edition) – New Age Publishers.

REFERENCE BOOKS

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons
2. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
3. Modern Physics by K. Vijaya Kumar, S. Chandralingam, *S.* Chand & Co.
4. Engineering Physics by R.K.Gaur and S.L.Gupta; DhanpatRai and Sons.

Course Outcomes:

- The student able to understand the properties of light propagation and interaction of light with matter, such interference, diffraction and polarization of light.
- The student able to understand the different types of bonding in solids and how they are classified in to different crystal groups. He also understand the non-destructive testing methods using X rays
- The student able to classify the crystal defects on the basis of their geometry. They can also understand different statistical distribution methods.
- The student is able to explain why the classical theory and quantum theory failed to explain the electrical properties of solids and how the band theory overcomes these failures.
- The student is able to understand various properties of semi-conductors materials.

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(A1016)ENGINEERING CHEMISTRY

Objectives:

- Knowledge of purification techniques and various applications of soft water in industries.
- Understand electrochemistry which deals with the utilization of electrical energy of an external source for bringing about a physical or chemical change.
- Knowledge of "Corrosion engineering education" and Usage of polymers in modern world as an integral part of every human's life.
- Provide practices for the prevention for corrosion
- The course provides a comprehensive survey of the concepts involved in the study of phase and chemical equilibrium.

UNIT I : Water Technology (20)
Sources of water – Impurities in water – Hardness of water – Temporary and Permanent Hardness – Units. Estimation of temporary and permanent hardness of water – EDTA method; Numerical problems; Potable Water treatment – Specifications; Steps involved in treatment - Sedimentation – Coagulation – Filtration – Sterilisation – Desalination of Brackish Water – Reverse Osmosis and Electro dialysis.
Industrial water treatment – Boiler Troubles – Scales and Sludges ; Caustic Embrittlement; Boiler Corrosion; Priming and Foaming. Hot lime and Cold lime soda process ; Numerical Problems; Zeolite Process and Ion Exchange Process. Internal conditioning methods like – Phosphate, Carbonate ,Calgon, Colloidal, Radioactive, Electrical and Sodium aluminate conditioning.

UNIT II :BATTERY TECHNOLOGY (6)
Electrode Potential – Determination of Single Electrode Potential;galvanic cells; Primary Cell – Dry or Leclanche Cell, Secondary Cell – Lead acid storage Cell ; Ni – Cd batteries, , Fuel Cell – Hydrogen Oxygen Fuel Cell. Methanol – Oxygen fuel cell.
Solar – Photoelectric cells – Applications of solar cells.

UNIT III :CORROSION AND ITS CONTROL (8)
Causes and effects of corrosion. Theories of Corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Waterline, Pitting and Inter granular); Pilling bed-worth Rule. Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (sacrificial anodic and Impressed current).

UNIT IV:PROTECTIVE COATINGS (8)
Surface coatings: Metallic coatings & methods of application of metallic coating – Hot dipping (Galvanization & Tinning); Cementation, Metal Cladding; Electroplating (copper plating); Electroless plating (Ni Plating); Organic coatings – Paints – Constituents and their functions. Varnishes, Enamels & Lacquers.

UNIT V: PHASE RULE (10)
Definitions of terms - Phase, Component and Degree of Freedom. Phase Rule Equation. Phase diagrams – One Component System – Water System; Two Component System – Silver Lead System; Cooling Curves. Iron – Carbon Phase Diagram; Heat treatment of steel. Hardening. Annealing, and Normalizing.

TEXT BOOKS
1. Engineering chemistry by B.Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012
2. Engineering Chemistry P.C.Jain and M.Jain, Dhanapat Rai & Sons
3. Engineering chemistry by Dr.Bharathi kumari,Dr.Jyotsna
4. Engineering chemistry by Thirumala chary,E.Laxminyarana ,SCITECHPublicationa(India) p ltd

REFERENCE BOOKS
1. A Textbook of Engineering Chemistry, S.S.Dara, S.Chand & Co.
2. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons
3. Engineering Chemistry, B.K.Sharma Et al

Course Outcomes:

At the end of the course student will be able to

- Benefits of treated water as source in steam generation and other fields like production of steel, paper, textiles, atomic energy etc.
- Analyze& describe how electrochemical concepts can be used in various practical applications, like batteries ,fuel cells etc.
- Apply knowledge of corrosion science to problems in materials engineering.
- Prevention of corrosion of metals and applications of polymers from domestic articles to sophisticated scientific and medical instruments.
- Develop chip level alloys by applying phase rule.

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(A1501)COMPUTER PROGRAMMING THROUGH C

Objectives:

- Understand computer basic's, algorithms, flowcharts and write simple 'C' programs, data types and operators and Console I/O functions.
- Understand Decision making statements and loops.
- Understand the concepts of functions and pointers.
- Understand the concepts of strings and various string handling functions and Arrays.
- Understand the concepts related to structures and able to differentiate between structure and union, Storing of large data using files.

UNIT – I

Introduction to Computers- Elements of computer processing, Hardware and software, Computing Environments, Computer Languages, SDLC ,Problem solving-algorithms , Pseudo code, and flowcharts.

Introduction to C Language- History, Structure of a C program, Simple C Program, Compilation process (program development).Identifiers, Data Types, Variables, Constants, Console I/O (printf, scanf), Operators – arithmetic, Relational, Logical, Conditional, Increment/decrement etc, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, pre-processor directives, Simple C Programming examples.

UNIT-II

Decision Statements and loops- Introduction, IF statement- (Simple IF Statement, the IF ELSE Statement, Nesting of IF ELSE Statement, The ELSE IF Ladder), Switch Statement, Repetition statements – (for, While, do-while), Jump statements, Simple C Programming examples.

UNIT-III

Functions: Defining functions, user defined functions, Standard functions, inter function communication, Passing arguments to functions, Returning values from functions, function calls, Reference arguments, Variables and storage classes, recursion- recursive functions, Limitations of recursion, example C programs, Command line arguments.

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Dynamic Memory Allocation, programming applications, pointers to void, pointers to functions.

UNIT-IV

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples, Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, array of pointers.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT-V

Structures and Union: Declaring and initializing a structure, Accessing the members of a structure, Nested structures, self referential structures, Array of structures, Using structures in functions, Pointers and structures, Declaring and initializing a union. Enumerated types, typedef, bit fields.

Files- Concept of a file, streams, text files and binary files, Differences between text and binary files, Modes 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, C program examples.

TEXT BOOKS

1. C programming A Problem-Solving Approach by Behrouz A.Forouzan, E.V.Prasad, Richard F. Gilberg C How to Program Paul Deitel and Harvey Deitel, PH.
2. Computer Programming and Data Structures by E Balagurusamy, Tata McGraw Hill.

REFERENCE BOOKS

1. Kanetkar Yashavant, Let Us C, BPB.
2. The C Programming Language by Brain W.Kernighan, Dennis M.Ritchie.
3. Programming in C, 2/e By Ashok Kamthane.
4. Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub.,1994.
5. Schaum's Outline of Programming with C by Byron S. Gottfried,1996

Electronic Materials, Websites

- http://en.wikiversity.org/wiki/Topic:C
- www.cprogramming.com

Course Outcomes:

1. Understand the algorithms, flowcharts implementation of simple 'C' programs, data types and operators and Console I/O functions.
2. Implement the decision control statements, loop control statements and case control statements.
3. Declare and implement the pointers and functions.
4. Declare and implement the arrays and strings.
5. Understand the structures declaration, initialization and implementation, understand the file operations, Character I/O, String I/O, File pointers and importance of pre-processor directives.

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(A1306) ENGINEERING DRAWING
(Common to ECE, CSE & EEE Branches)

Pre-requisite: Nil

Objective: The objective of this subject is to provide the basic concepts about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning and specifications.
Codes / Tables: Nil

Question Paper Pattern:
5 Questions to be answered out of 8 questions.
Each question should not have more than 3 bits.

UNIT – I
INTRODUCTION TO ENGINEERING DRAWING :
Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid,
Involute. Scales – Plain, Diagonal and Vernier Scales.

UNIT- II
ORTHOGRAPHIC PROJECTIONS:
Principles of Orthographic Projections – Conventions – Projections of Points and Lines
Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III
PROJECTIONS OF SOLIDS: Projection of regular solids, cube, prisms, pyramids, cone –use of Auxiliary Views.

UNIT – IV
ISOMETRIC PROJECTIONS :
Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

UNIT-V
TRANSFORMATION OF PROJECTIONS: Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.

REFERENCE BOOKS:
1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics With Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.
4. Text book on Engineering Drawing / KL Narayana/ P Kannaih / Scitech

By undergoing this course, students will be
1. Able to understand the conventions and the methods of engineering drawing.
2. Able to understand and draw the projections of points, lines, planes and solids in different types of projections.

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B.Tech EEE-I Sem **L T P C**
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(A1542)COMPUTER PROGRAMMING LAB

Objectives:

- To understand the various steps in program development.
- To understand the basic concepts in C Programming Language.
- To understand different modules that includes conditional and looping expressions.
- To understand how to write modular and readable C Programs.
- To write programs in C to solve problems using arrays, structures and files.

	WEEK WISE PROGRAMS
Week1	(a)Write a simple C program to Print "Hello World" (b) Write a simple C program Declaring Variable and Printing its Value (c) Write a simple C Program to Calculate Area and Circumference of Circle (d)Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.
Week 2	Write C programs to demonstrate the following operators (a) Assignment Operator. (b) Relational and Logical Operator. (c) Increment and decrement operator. (d) Bitwise operators. (e) Ternary operator.
Week3	(a) Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder). (b)The total distance travelled by vehicle in't' seconds is given by distance=$ut+1/2at^2$ where 'u' and 'a' are the initial velocity and acceleration. Write a c program to find the distance travelled at regular intervals of time given the Values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'. (c)Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (consider the operators +,-,*,/,% and use switch statement).
Week4	(a)Write a C program to find the sum of individual digits of a positive integer (b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence. (c) Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
Week5	(a)Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$ (b) Write a C program to generate Pascal's triangle. (c) Write a C program to construct a pyramid of numbers
Week6	(a)Write a programs that use both recursive and non-recursive functions (i)To find the factorial of a given integer.(non- recursive) (ii)To find the GCD of two given integers.(Non-recursive)
Week7	(a)Write a c program to find both the largest and smallest number in a list of integers. (b)write a c program that uses functions to perform the following: (i)Addition of Two Matrices. (ii)Multiplication of Two Matrices.
Week8	(a) Write a c program that uses functions to perform the following operations: (i)To insert a sub-string in given main string from a given 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
Week9	(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 .
week10	Write a C program that uses functions to perform the following operations: i) Reading a complex number ii) Writing a complex number iii) Addition of two complex numbers

	iv) Multiplication of two complex numbers (Note: represent complex number using a structure.)
week11	(a)Write a C program which copies one file to another (b) Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line).
week12	(a) Write a C programme to display the contents of a file. (b) Write a C programme to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Course Outcomes

- Basics of C programming, Usage of various operators
- Ability to develop programs on strings and usage of functions
- Ability to develop programs on files

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(A1015)ENGINEERING PHYSICS LAB

(Any ten experiments compulsory)

1. Determination of wavelength of a source – Diffraction Grating.
2. Newton's Rings - Radius of curvature of plano convex lens.
3. Melde's experiment – Transverse and longitudinal modes.
4. Time constant of an R-C circuit.
5. L-C-R circuit.
6. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
7. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
8. Energy gap of a material of p-n junction.
9. Torsional pendulum.
10. Wavelength of light –Diffraction grating using laser.
11. Sonometer-AC power supply.
12. Characteristics of a LED.
13. Characteristics of a photodiode.
14. Characteristics of a solar cell.
15. Determination of velocity of ultrasonic waves.

LABORATORY MANUAL:
1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.VenkateswaraRao (V.G.S Publishers).

Objectives:
This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.TechIst year.
The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.
The experiments are selected from various area of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.
Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

Course Outcome
The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.
With the exposure to these experiments the student can compare the theory and correlate with experiment.

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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(A1303) ENGINEERING WORKSHOP
(COMMON TO ALL BRANCHES)

I TRADE FOR EXERCISE:
(Two experiments each from any six trades of the following)

1. Carpentry
2. Fitting
3. Tin-smithy
4. House-wiring
5. Foundry
6. Plumbing
7. Welding
8. Black smithy

II TRADES FOR DEMONSTRATION AND EXPOSURE:

1. Power tools
2. Machine tools

TEXT BOOK: Workshop Manual, Second edition/ P Kannaiah and K L Narayana/ Scitech publishers

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(A1002)ENGLISH-II

The fundamental aim of this course is to help the student to become a confident and competent communicator in written and spoken English. The methodology in teaching and evaluation shall be oriented towards this end, rather than rote memorization.
Prerequisite: Acquaintance with basic High School Grammar and Composition

GENERAL OBJECTIVES:
To enable the students:
1. to listen critically for speaker's tone or attitude
2. to narrate, express opinions and participate in conversations
3. to read critically to draw inferences and gain comprehension
4. to write project proposals, technical reports formally

SKILLS-WISE OBJECTIVES:

Listening Skills:

- To enable students to develop their listening skill for main points and sub-points for note taking
- To equip students with necessary training in listening for specific details and information

Speaking Skills:

- To make students aware of the language required for giving instructions and directions
- To enable students to express themselves clearly in hypothetical situations
- To enable students to make presentations formally.

R***eading Skills:***

- To develop an awareness among the students about the significance of reading for reference and details
- To develop the ability of Reading for specific details and information

Writing Skills:

- To develop an awareness in the students about Report writing and Information Transfer
- To equip them with the components of Writing formal letters and CVs
- To enable them with different forms of writing like Project proposals, Technical reports, Project Reports and Research Papers.

SYLLABUS:

UNIT I

- Chapter entitled '**Risk Management'** from "Skills Annexe -Functional English for Success" Published by Orient Black Swan, Hyderabad
  - L – for main points and sub-points for note taking
  - S – giving instructions and directions; Speaking of hypothetical situations
  - R – reading for details
  - W – note-making, information transfer, punctuation
  - G – present tense
  - V – synonyms and antonyms
  - Report writing
  - Information Transfer

UNIT –II

- Chapter entitled 'The Convocation Speech' by N.R. Narayanmurthy' from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad
  - L- Speech on 'How do you make a teacher great?'
  - S- Role play – Interviewing famous personalities
  - R- Critical reading, reading for reference – 'What is meant by Entrepreneurship?'
  - W-Essay writing
  - G- Focussing with passive voice

- V- One word substitutes

UNIT –III

- Chapter entitled 'Leela's Friend' by R.K. Narayan from "Epitome of Wisdom", Published by Maruthi Publications, Hyderabad
  - L – for main points and sub-points for note taking
  - S – Presentations
  - R – reading for details
  - W – note-making, information transfer, punctuation
  - V – Guessing the words, using an appropriate word, Phrasal verbs

UNIT –IV

- Chapter entitled 'Human Values and Professional Ethics' from "Skills Annexe -Functional English for Success" Published by Orient Black Swan, Hyderabad
  - L -Listening for specific details and information
  - S- narrating, expressing opinions and telephone interactions
  - R -Reading for specific details and information
  - W- Writing formal letters and CVs
  - G- Past and future tenses
  - V- Vocabulary - idioms and Phrasal verbs

UNIT –V

- Chapter entitled 'Sports and Health' from "Skills Annexe -Functional English for Success" Published by Orient Black Swan, Hyderabad
  - L- Critical Listening and Listening for speaker's tone/ attitude
  - S- Group discussion and Making presentations
  - R- Critical reading, reading for reference
  - W-Project proposals; Technical reports, Project Reports and Research Papers
  - G- Adjectives, prepositions and concord
  - V- Collocations and Technical vocabulary Using words appropriately

Course outcomes:

By the end of the course students will be able to:

- Develop ability to listen critically for information
- Express opinions and participate in conversations confidently
- Develop focused reading for details and information
- Write project proposals, technical reports and CVs formally

TEXT BOOKS PRESCRIBED

In order to improve the language skills needed for professional students, the following textbooks and course content have been prescribed to expose the students to a variety of genres, themes and language styles.
A Text book entitled **"Skills Annexe", -Functional English to Success** Published by Orient Black Swan, Hyderabad
A text book entitled, **"Epitome of Wisdom",** Published by Maruthi Publications, Hyderabad.
The course content and study material are divided into Five Units.

REFERENCES:

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishnaRao, P Sreehari, Published by Pearson
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata McGraw –Hill.
7. Spoken English, R.K. Bansal&JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press
9. Objective English Edgar Thorpe &Showick Thorpe, Pearson Education
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe &Showick Thorpe, Pearson Education

15. Effective Technical Communication, M Ashraf Rizvi, Tata McGraw –Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and HemlathaNagarajan , Frank Bros & CO
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publisher

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(A1007)ADVANCED CALCULUS

Objectives

- Solve Differential Equations of first order using various methods and their applications.
- Solve Differential Equations of multiple orders using various methods and their applications.
- Possible to transform from one form another form by using Laplace Transforms(Used in Signals and systems).
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required. Indeed, any periodic and non-periodic function.
- Choose coordinate systems (polar, spherical, cylindrical, rectangular) appropriate to a given problem.

UNIT-I: Differential equations of first order and their applications
Over view of Differential equations – exact, Linear and Bernoulli's. Applications to Newton's Law of cooling, Law of Natural growth and decay, orthogonal trajectories.

UNIT-II: Higher order Linear differential equations and their applications
Linear differential equations of second and higher order with constant coefficients.RHS term of the type $f(x) = e^{ax}, \sin ax, \cos axandx^n, e^{ax}V(x), x^nV(x)$, method of variation of parameters. Applications to bending of beams, Electrical circuits, Simple harmonic motion.

UNIT-III: Laplace Transform and its applications to Ordinary Differential Equations
Laplace transform of standard functions – Inverse transform- First Shifting theorem, Transforms of derivatives and integrals – Unit step function – Second Shifting theorem – Dirac's delta function- Convolution theorem – Periodic function – Differentiation and integration of transforms – Application of Laplace transforms to ordinary differential equations.

UNIT-IV: Fourier Series
Determination of Fourier coefficients – Fourier Series – even and odd function – Fourier Series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

UNIT-V: Vector Calculus
Vector Differential Calculus: Scalar & vector point functions, Gradient – Divergence – Curl with geometrical & Physical interpretation. Directional derivatives, Vector differential operators &their related properties.

Vector Integral Calculus: Line integral – Work done – scalar potential function, surface integrals – Flux of Vector valued function, Volume integrals.
Vector integral theorems: Gauss's Divergence theorem, Green's theorem, Stoke's Theorem (Statement and their verification).

TEXT BOOKS

1. Kreyszig's Engineering Mathematics – I by Dr. A. Ramakrishna Prasad, 2014yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS

1. Kreyszig's Mathematical Methods by Dr. A. Ramakrishna Prasad, 1st Edition John Wiley Publications.
2. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
3. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
4. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
5. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
6. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2012 Yr. Edition S.Chand.
7. Engineering Mathematics – I by D.S. Chandrasekhar, Prison Books Pvt. Ltd.
8. Engineering Mathematics – I by G. ShankerRao& Others I.K. International Publications.

Course Outcomes

- The students be able understand the formation and evaluation of different differential equations by various methods.
- The students be able to analyze certain physical problems (tank flow, mechanical and electrical vibration),set up their determining differential equations, solve them using the techniques to answer questions about the physical system.
- The students be able to solve linear, simultaneous equations to analyze voltages and currents in AC to DC (phase) circuits. Determine the average power dissipated in a circuit. Calculate voltages and currents in single phase circuit.
- The students be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- The students be able to evaluate multiple integrals (line, surface, volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.

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(A1008)MATHEMATICAL METHODS

Objectives

- Obtain an intuitive and working understanding of some Mathematical Methods for the basic problems of numerical analysis.
- Develop some experience in the implementation of numerical methods in engineering applications by using a computer.
- Solutions of Ordinary Differential Equations using numerical methods.
- The aim at forming a partial differential equation (PDE) for a function with many variables and their solution methods. Two important methods for first order PDE's are learnt. While separation of variables technique is learnt for typical second order PDE's such as Wave, Heat and Laplace equations.
- Evaluate the Fourier transform of a continuous function, and be familiar with its basic properties.

Unit – I:Solutions of Linear & Non-Linear equations

Introduction to Algebraic and Transcendental Equations, Bisection Method, Method of False Position (Regula – False Method), Iteration Method, Newton – Raphson's Method, Errors in Polynomial.Gauss Jacobi's iterative method, Gauss-Seidel Method.

Unit – II: Interpolation& Curve fitting

Forward , Backward & Central Differences, Symbolic Relations, Newton's Forward & Backward Interpolation, Gauss's Forward & Backward Interpolation, Lagrange's Interpolation & Problems.
Fitting straight line, Fitting Non-Linear curve, Curve fitting by sum of Exponentials, Non-Linear Weighted least squares approximation.

Unit –III: Numerical Differentiation, Integrations & Solutions of ODE

Numerical Differentiation, Derivatives using forward & backward difference formula, Derivatives using central difference formula, Trapezoidal Rule, Simpson's 1/3 Rule,3/8 Rule.
Introduction to Numerical solutions of ODE, Taylor's series method, Picard's method of Successive Approximations, Euler's method, Euler's Modified method, Runga-Kutta method , Predictor and Corrector method, Milne's Predictor and Corrector method, Adams-Moulton method.

Unit – IV: Partial differential equations

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method).Method of separation of variables for second order equations – applications of Partial differential equations – Two dimensional wave equation.Heat equation.

Unit – V: Fourier transforms & Z-transforms

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – Inverse transforms – Finite Fourier transforms.

Z-transforms, inverse Z-transforms, properties, Damping rule, shifting rule, initial and final value theorems, convolution theorem, solution of difference equations by Z-transforms.

TEXT BOOKS

1. Kreyszig's Mathematical Methods by Dr. A. Ramakrishna Prasad, 2014 yr Edition John Wiley Publications.
2. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

REFERENCE BOOKS

1. Advanced Engineering Mathematics by Kreyszig, 8th Edition, John Wiley & Sons Publishers
2. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
4. Mathematics for Engineering and Scientists. Alan Jeffrey, 6th Edi, 2013, Chapman & Hall / CRC
5. Introductory Methods of Numerical Analysis , S.S.Sastry, 4h Edition, Prentce Hall of India Pvt. Ltd.
6. Mathematical Methods by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2013 Yr. Edition S.Chand.
7. Mathematical Methodsby D.S. Chandrasekhar, Prison Books Pvt. Ltd.
8. Mathematical Methods by G. ShankerRao& Others I.K. International Publications.

Course Outcomes

- Able to compute root of nonlinear equations by using different types of numerical methods.
- Able to familiar with different kinds of techniques for interpolating data
- Able to solve ODE Initial Value Problems using Euler's , Taylor's, Picard's & R-K methods,
- Able to differential equation for an unknown function with many independent variables and to find their solution. Most of the problems in physical and engineering applications, problems are highly non-linear and hence expressing them as PDEs'. Hence understanding the nature of the equation and finding a suitable solution is very much essential.
- Able to evaluate the Fourier transform of a continuous function, and be familiar with its basic properties.

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(A1014)ENGINEERING PHYSICS-II

Objectives:

- To understand the introductory level the concept of optical coherence, lasers and optical fiber characteristics.
- To understand the basic principles of dielectric properties of solids.
- To understand the physical principles underlying the magnetic and super conducting properties of solids.
- To understand the fundamental concepts of electromagnetic fields and laws governing them.
- To understand the basic principles of nanotechnology, ultrasonic and acoustics of buildings.

UNIT-I

Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein's coefficients and relation between them, population inversion, lasing action in ruby laser, Helium-Neon laser, semiconductor diode laser, applications of lasers.

Fiber Optics: Principle of optical fiber, construction of fiber, acceptance angle and acceptance cone, numerical aperture, types of optical fibers: step index and graded index profiles, attenuation in optical fibers, optical fiber communication, optical fiber sensors.

UNIT-II: Dielectric Properties

Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic, ionic, orientation and space charge polarizations and derivation of polarizabilities, internal fields in solids, Clausius - Mossottiequation, piezo-electricity, ferro- electricity and pyro-electricity.

UNIT-III: Magnetic Properties & Superconducting Properties

Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr Magneton, classification of dia, para and ferro, ferri and anti-ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve, soft and hard magnetic materials.

Super conductivity: Introduction, critical field, Meissner effect, effect of magnetic field, type-I and type-II superconductors, BCS theory (qualitative), applications of superconductors.

UNIT-IV: Electromagnetic Theory

Review of steady and varying fields – Conduction and displacement current – Maxwell's equations in integral and differential forms – Electromagnetic wave equations in free space, dielectric and conducting media – Poynting theorem.

UNIT-V: Nanotechnology

Origin of nanotechnology, nano scale, surface to volume ratio, quantum confinement, bottom-up fabrication: sol-gel, precipitation, combustion methods; top-down fabrication: chemical vapour deposition, physical vapour deposition, pulsed laser vapour deposition methods, characterization by XRD & TEM; properties and applications.

Acoustics: Basic requirements of acoustically good hall,reverberation and time of reverberation, Sabine's formula for reverberation time, measurement of absorption coefficient of a material, factors affecting the architectural acoustics and their remedies.

Ultrasonics: Introduction, production of ultrasonics using piezoelectric method –magnetostriction method-applications.

TEXT BOOKS

1. Engineering Physics by P K PalaniSamy, ScitechPublications.
2. Applied Physics for Engineers by Dr.P.MadhusudanaRao, Academic Publishing Company.
3. Solid State Physics by S.O.Pillai (Main edition) – New Age Publishers.

REFERENCE BOOKS

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons
2. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
3. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.
4. Engineering Physics by R.K.Gaur and S.L.Gupta; DhanpatRai and Sons.

Course Outcomes

- Able to understand to understand the principle, construction, characteristics of laser and their applications in optical fiber communication
- Able to understand the various polarization processes in solids and classify different dielectric materials.
- Able to classify the magnetic materials in to various classes depending upon their magnetic moment. They are also able to understand the basics principles of superconductivity.
- Able to understand of Maxwell's equations and be able to manipulate and apply them to EM problems.
- Able to understand how the properties of the material changes on nano scale. He can also understand the characteristics and production of ultrasonic. He will learn the basic requirements of a hall for good acoustics.

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(A1017) ADVANCED ENGINEERING CHEMISTRY

(COMMON TO ECE, EEE, AND CSE)

Objectives:

- Understand electrochemistry which deals with the utilization of electrical energy of an external source for bringing about a physical or chemical change.
- To give the students a basic understanding on polymers. The peculiar properties of the macromolecules are emphasized
- Understanding the significance of various Engineering materials like cement abrasives, adhesives and composites in structural enhancement of materials.
- A sustainable energy supply, is needed for promoting economic development as well as protecting the environment.
- To provide an overview of Industrial applications of surface chemistry.

UNIT I: ELECTROCHEMISTRY (13)

Electrochemistry- Conductance- Specific, Equivalent and Molar conductance and their units. Applications of Conductance (conductometric titration). Kohlrausch's law of Independent Migration of Ions, Concept of P^H and P^{OH}, Buffer solutions, Arrehenius Ionic Theory.

Galvanic cells, Types of Electrodes (Calomel, Quinhydrone and Glass Electrode); Nernst Equation and its applications; Concept of concentration cells; Electro chemical series, Potentiometric titrations, Determination of P^H using glass electrode – Numerical problems.

UNIT II: HIGH POLYMERS (12)

polymers: Types of polymerization (addition, condensation and copolymerization) .

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, Engineering applications of PVC, Teflon and Bakelite.

Fibers: Characteristics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fibre Reinforced Plastics (FRP) – applications.

Rubbers: Natural rubber and its vulcanization.

Elastomers : Buna – s, Butyl rubber and Thiokol rubber.

Conducting Polymers: Polyacetylene, Polyaniline, Mechanism of conduction doping, applications of conducting polymers.

Bio-degradable Preparation and applications of Polyvinyl acetate and Polylactic acid.

UNIT III: MATERIAL CHEMISTRY (12)

Nanomaterials: Introduction, preparation by sol-gel and chemical vapour deposition methods, Carbon nano fibres, Nano gold particles and fullerenes; Applications of nanomaterials.

Superconductors, Semiconductors, Insulators and its applications.

Glass: Manufacture of Glass; Types of glass – Hard glass, Soft glass and Pyrex glass.

Refractories – Classification, properties, Characteristics of a good refractory material and its applications.

UNIT IV: ENERGY SOURCES (12)

Fuels – Classification.Solid fuels; Coal – analysis of coal – proximate and ultimate analysis and their significance.

Liquid fuels – Petroleum and its refining, Cracking, Types- fixed bed catalytic cracking; Knocking – octane and cetane rating; Synthetic petrol, Bergius and Fischer Tropsch process;

Gaseous fuels- constituents, characteristics and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical problems.

Combustion – Definition, calorific value of fuel – HCV, LCV, Determination of calorific value by Junker's gas calorimeter – theoretical calculation of calorific value by Dulong's formula – Numerical problems on combustion.

UNIT V: SURFACE CHEMISTRY(8)

Adsorption – Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption.

Colloids: Classification of colloids; Mechanical – Brownian movement. Electrical – Electrophoresis, Electro-osmosis. Iso electric point. Optical – Tyndall effect. Micelles. Applications ofcolloids in industry.

TEXT BOOKS

1. Engineering chemistry by B.Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012
2. Engineering Chemistry P.C.Jain and M.Jain, Dhanapat Rai & Sons
3. Engineering chemistry by Dr.Bharathi kumari,Dr.Jyotsna
4. Engineering chemistry by Thirumala chary,E.Laxminyarana ,SCITECHPublicationa(India) p ltd

REFERENCE BOOKS

1. A Textbook of Engineering Chemistry, S.S.Dara, S.Chand & Co.
2. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons
3. Engineering Chemistry, B.K.Sharma Et al

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

- Visualize the chemical applications of electricity.
- Understand why polymers are different than simple molecules, what are the basic kinds of polymers, their chemical structures and physical properties, the well-known techniques in polymer synthesis, the chemistry of polymer synthesis and the different types of mechanisms employed in polymer synthesis.
- The applicability and greater efficiency of using materials at different engineering fields, Understand the manufacturing process of cement, its properties and usage of abrasives, adhesives and composites in various industrial processes.
- Acquire knowledge of the types of fuels, their sources and purification techniques.
- Able to describe what kind of interactions may occur on the surface of adsorbent, Industrial applications of surface chemistry.

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(A1502)DATA STRUCTURES THROUGH C

Objectives
- To understand the behavior of data structures such as stacks, queues.
- To write and execute programs in C to solve problems using Data Structures such as arrays, Linked Lists, Trees and Graphs.
- To write and execute programs in C to implement various Sorting and Searching methods.

UNIT-I
Linear Data Structures - Introduction to Data Structures, Abstract data types, Strategies for choosing the appropriate data structure, Introduction to Linear and Non-Linear Data Structures.
Singly linked list- Operations, insertion, deletion, Concatenating singly linked lists, circular linked list- operations for Circular Linked lists. Doubly linked list- Operations- insertion, deletion, Representations of single, two dimensional arrays (RMO & CMO).

UNIT-II
Stack ADT: Definition, operations, array and linked representations of stacks, Applications: Infix to postfix conversion, postfix expression evaluation, Recursion implementation, Towers of Hanoi problem.

UNIT-III
Queue ADT: Definition & Operations, Array and linked implementation in C , Circular Queues- Insertion and deletion operations. Deque(Double ended queue)ADT- Array and linked implementation in C. Applications of Queues- Priority queues,

UNIT-IV
Non-Linear Data Structures
Trees- Terminology, Representation of Trees **,** Binary Tree ADT, Properties of Binary Trees ,Binary Tree Representations-Array and Linked Representation. Binary Search Tree, Binary Tree Traversals.
Graphs – Introduction, Definitions, Terminology Graph ADT Graph Representations-Adjacency Matrix, Adjacency Lists. Graph traversals-DFS and BFS.
UNIT-V
Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Performance analysis of Searching and Sorting techniques using Asymptotic notations. Comparison of sorting methods.

TEXT BOOKS
1. Yedidyah Langsam, Moshe J. Augenstein and Aaron M. Tenenbaum, Data Structures using C and C++. 2 ed, Pearson Education.
2. C Programming& Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
3. Fundamentals of Data Structures in C,2nd Edition,E.Horowitz,S.Sahani and Susan.

REFERENCE BOOKS
1. C Programming & Data Structures, E. Balagurusamy, TMH.
2. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
3. Mark Allen Weiss, Data structures and Algorithm Analysis in C. Addison Wesley Publication.

Electronic Materials, Websites:

1. https://www.youtube.com/user/mycodeschool
2. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Outcomes
- Ability to identify appropriate data structure for solving computing problems in respective language.
- Ability to solve problems independently and think critically.

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(A1543)DATA STRUCTURES LAB

Objectives:

- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data Structures.
- To understand the behavior of data structures such as stacks, queues.
- To write and execute programs in C to solve problems using Data Structures such as arrays, Linked Lists, Trees and Graphs.
- To write and execute programs in C to implement various Sorting and Searching methods.

	WEEK WISE PROGRAMS
Week1	Write a C program that uses functions to perform the following (i)Creating a Singly linked list of integers (ii)Delete a given integer from above linked list. (iii)Display the contents of the above list after deletion
Week2	Write a C program that uses functions to perform the following (i)Creating a Doubly linked list of integers (ii)Delete a given integer from above linked list. (iii)Display the contents of the above list after deletion
Week 3	Write C programs to implement Stack ADT using (i)Array (ii)Linked List
Week4	Write C programs to implement Queue ADT using (i)Array (ii)Linked List
Week5	Write a C program that uses stack operations to convert a given infix expression in to its postfix equivalent.(Implement the Stack using Array)
Week6	Write a C program to implement double ended queue ADT using (i)Array and (ii) Doubly linked list respectively.
Week7	Write a C program that uses functions to perform the following (i)Create a Binary Search Tree of Integers (ii)Traverse above binary search tree recursively in Pre- Order Post -Order, In-Order
Week8	Write a C program that uses functions to perform the following (i)Create a Binary Search Tree of Integers (ii)Traverse above binary search tree non-recursively in In- Order.
Week9	Write C programs for implementing the following Sorting methods for sorting a given list of integers in ascending order. (i)Bubble Sort (ii)Quick Sort(iii) Insertion Sort
Week10	Write C programs for implementing the following Sorting methods for sorting a given list of integers in ascending order. (i) Selection Sort (ii) Merge Sort
Week 11	(a)Write a C program for implementing the Depth First Search graph traversal algorithm using (i) recursion (ii) without recursion. (b) Write a C program for implementing the Breadth First Search graph traversal algorithm using queues.
Week12	Write C programs for implementing the following Search methods (i)Linear Search (ii) Binary Search

Course Outcomes

1. Ability to understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data Structures.
2. Understand the behavior of data structures such as stacks, queues.

3. Developed & executed programs in C to solve problems using Data Structures such as arrays, Linked Lists, Trees and Graphs.
4. Understand the behavior of various Sorting and Searching methods.

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(A1019) ENGINEERING CHEMISTRY LAB

I. Inorganic chemistry experiments by Analytical methods.

Water Analysis:

1. Estimation of Hardness of water by EDTA method
2. Estimation of Alkalinity of water.

II. Instrumentation.

3. Estimation of Copper by colorimetric Method.
4. Conductometric Titration of a strong acid vs a strong base
5. Potentiometric Titration of a strong acid vs a strong base

III. Identification and preparation of organic compounds

6. Preparation of ASPIRIN
7. Preparation of Thiokol Rubber

IV. Physical chemistry experiments

8. Determination of Viscosity of a Liquid.
9. Determination of Surface Tension of a liquid.
10. Adsorption of acetic acid on activated charcoal
11. Determination of melting point and Boiling point of given solids and liquids

V. Cement Analysis

12. Determination of Ferric iron in cement by Colorimetry

Laboratory Manual:
Laboratory maual of engg chemistry by Mukkantietal, VGS publications

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

B.Tech EEE-II Sem **L T P C**
0 0 3 2

(A1003) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Introduction:

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

Objectives

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

Syllabus:

English Language Communication Skills Lab shall have **two** parts:

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

The following course content is prescribed for the English Language Communication Skills Lab

Exercise – I

- **CALL Lab**: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
- **ICS Lab**: Ice-Breaking activity and JAM session Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

- **CALL Lab:** Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
- **ICS Lab:** Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette. Concord (Subject in agreement with verb) and Words often miss pelt- confused/misused

Exercise – III

- **CALL Lab**: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.
- **ICS Lab**: Descriptions- Narrations- Giving Directions and guidelines. Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV

- **CALL Lab**: Intonation and Common errors in Pronunciation.
- **ICS Lab**: Extempore- Public Speaking Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V

- **CALL Lab**: Neutralization of Mother Tongue Influence and Conversation Practice
- **ICS Lab**: Information Transfer- Oral Presentation Skills Reading Comprehension.

Learning Outcomes:

By the end of the course students will develop:

- Better Understanding of nuances of language through audio- visual experience and group activities

- Neutralization of accent for intelligibility
- Speaking ability with clarity and confidence to enhance their employability skills.

Minimum Requirement of infra structural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners. R13 B.Tech I year syllabus System Requirement (Hardware component): Computer network with Lan with minimum 60 multimedia systems with the following specifications: i) P – IV Processor a) Speed – 2.8 GHZ b) RAM – 512 MB Minimum c) Hard Disk – 80 GB ii) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab: The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

DISTRIBUTION AND WEIGHTINGOF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for **25** sessional marks and **50** year-end Examination marks. Of the **25** marks, **15** marks shall be awarded for day-to-day work and **10** marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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B.Tech EEE II-Sem **L T P C**
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(A1544) IT WORKSHOP LAB

Objectives:

- The IT Workshop for engineers is a training lab course spread over 42 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point.

Outcomes:

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

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 and LaTeX. (**Recommended to use Microsoft office 2007 in place of MS Office 2003).**

PC Hardware:

Week 1 – Task 1 : Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Week 2 – Task 2 : Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Week 3 – Task 3 : Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Week 4 – Task 4 : Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Week 5 – Task 5: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Internet & World Wide Web:

Week 6 - Task 1 : **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2 : Web Browsers, Surfing the Web : Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Week 7 -Task 3: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Productivity tools

LaTeX and Word:

Week 8 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

Task 1: Using LaTeX and Word 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 both LaTeX and Word.

Week 9 - Task 2: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Week 10 - Task 3 : Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel:

Week 11 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Week 12 - Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

LaTeX and MS/equivalent (FOSS) tool Power Point:

Week 13 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point.Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Week 14 - Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Task 3: Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

REFERENCE BOOKS

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

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B.Tech EEE-III Sem **L T P C**
4 1 0 4

(A1009) SPECIAL FUNCTIONS & COMPLEX ANALYSIS

Objectives: To learn
- Series solutions for Legendre and Bessel differential equations, analyzing the properties of Legendre and Bessel polynomials**.**
- Evaluation of improper integrals using Beta, Gamma functions
- Differentiation and Integration of Complex valued functions
- Evaluation of integrals using Cauchy's integral formula.
- Taylor's series , Maclaurin's series and Laurent's series expansions of complex functions
- Evaluation of integrals using residue theorem
- Transform a given function from z-plane to w-plane
- Identify the transformations like translation magnification,rotation and reflection and inversion
- Properties of bilinear transformations

UNIT – I: Special Functions
Gamma and Beta Functions – Their properties – evaluation of improper integrals. Bessel's functions – properties – Recurrence relations – Orthogonality.Legendre's polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality.

UNIT – II: Functions Of Complex Variables
Continuity – Differentiability – Analyticity – Properties – Cauchy- Riemann conditions, Maxima – Minima Principle, Harmonic and conjugate harmonic functions – Milne – Thompson method. Elementary functions, general power of Z principal value Logarithmic function.

UNIT – III: Complex integration & Complex Power Series
Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.
Complex Power Series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – pole of order m – essential singularity. (Distinction between and real analyticity and complex analyticity)

UNIT – IV: Contour Integration & Conformal Mapping
Contour Integration: Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)\,dx$ (b) $\int_{0}^{2\pi} f(\cos\theta, \sin\theta)\,d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)\,dx$ (d) Integrals by indentation

Conformal Mapping: Transformation by $e^z, \text{Im}\, z, z^2, z^n, \sin z, \cos z, z + a/z$. Translation, Rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circle and cross ratio – determination of bilinear transformation mapping 3 given points.

UNIT – V: Elementary Graph Theory
Graphs, Representation by matrices adjacent matrix – Incident matrix – Simple, Multiple, Regular, complete, Bipartite& Planar graphs – Hamiltonian and Eulerian Circuits – Trees Spanning tree – minimum spanning tree.

TEXT BOOKS
1. Advanced Engineering Mathematics by R.K. Jain &S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Complex variables and applicationsbyJames Ward Brown, Ruel Vance Churchill – McGraw Hill

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REFERENCES
1. Higher Engineering Mathematics by B.S. Grewal, 36th Edition, Khanna Publishers.
2. Engineering Mathematics – III by T. K. V. Iyengar, B.Krishna Gandhi and others, 2014 Yr Edition S. Chand.
3. Engineering Mathematics – III by P.B. BhaskaraRao, S.K.V.S. Rama Chary, M. BhujangaRao& others.
4. Engineering Mathematics – III by C. Shankaraiah, V.G. S. Book Links.
5. Advanced Engineering Mathematics by Allen Jaffrey Academic Press.

Course Outcomes: After going through this course the student will be able to:

- Identify Bessel equation and Legendre equation and solve them under special conditions with the help of series solutions method. Also recurrence relations and orthogonality properties of Bessel and Legendre polynomials.
- Evaluation of improper integrals using Beta and Gamma functions
- Analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
- Find the Taylor's and Laurent series expansion of complex functions
- The conformal transformations of complex functions can be dealt with ease
- Various graphs and trees can be analyzed

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(A1201) NETWORK THEORY - I

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

UNIT – I: Introduction to Electrical Circuits
Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements. Kirchhoff's laws-network reduction techniques-series, parallel, series parallel, star-to-delta and delta-to-star transformation, Nodal analysis, mesh analysis, super node and super mesh for D.C.excitations.

UNIT – II: Single Phase A.C Circuits
R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of Reactance, Impedance, Susceptance and Admittance – Phase and Phase difference – concept of power factor, Complex power, Real and Reactive powers – J-notation, Complex and Polar forms of representation.

UNIT – III: Locus diagrams , Resonance & Magnetic Circuits
Locus diagrams – series R-L, R-C and parallel combination with variation of various parameters – Resonance – series, parallel circuits, concept of band width and Q factor.
Magnetic circuits-Faraday's laws of electromagnetic induction-concept of self and mutual inductance-dot convention-coefficient of coupling-composite magnetic circuit-analysis of series and parallel magnetic circuits.

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

UNIT – V Network theorems (with DC & AC)
Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's.Maximum Power Transfer, Millman's and Compensation theorems for DC & AC excitations.

TEXT BOOKS
1. Engineering circuit analysis – by William Hayt and Jack E. Kimmerly, Mc Graw Hill Company, 6th edition.
2. Circuits & Networks by A.Sudhakar and Shyammohan S Palli,Tata McGraw-Hill
3. Electric Circuits by A.Chakrabarthy,Dhanipat Rai & Sons

REFERENCE BOOKS
1. Network Analysis by M.E.Van Valkenberg.
2. Linear circuit analysis (time domain phasor and Laplace transform approaches).Second edition by Raymond
3. A.Decarlo and PEN-MIN-LIN.Oxford University Press.Second edition 2004.
4. Electrical Circuits theory by K.Rajeswaran,Pearson Education 2004.
5. Basic circuit analysis by D.R.Cunningham & J.A.Stuller,Jaico Publications.

Course Outcomes
- Able to know the circuit element, source transformation, Kirchhoff's laws and network reduction techniques.
- Able to identify when & how to use network reduction & theorem with DC and AC excitations.
- Able to understand the principle of AC fundamentals, series parallel circuits, locus diagram and resonance.
- Able to understand the basic principle of magnetic circuits & applications.
- Capable of adopting network topology for analysis of networks, concept of duality and dual networks.

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(A1202) ELECTROMAGNETIC FIELDS

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

UNIT – I: Electrostatics
Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div (D)=ρv . Laplace's and Poison's equations – Solution of Laplace's equation in one variable

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

UNIT – III: Magneto Statics
Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0.
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 – IV: Force in Magnetic fields and Magnetic Potential:
Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field .
Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.
Self and Mutual inductance
Self and Mutual inductance – Neumans's formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

UNIT – V: Time Varying Fields*:*
Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl (E)=-∂B/∂t – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current.

TEXT BOOKS
1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. "Electro magnetic Fields" by Sadiku, Oxford Publications

REFERENCE BOOKS
1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd editon
2. "Electromagnetics" by J P Tewari.
3. "Electromagnetics" by J. D Kraus Mc Graw-Hill Inc. 4th edition 1992.
4. "Electromagnetic fields", by S. Kamakshaiah, Right Publishers, 2007.

Course Outcomes

- Ability to know the basic concepts of electro-static fields produced by static electric charges and their behavior. Study of Gauss law its application & Maxwell's 1st law.
- Ability to solve boundary valve problems uses Laplace & poissions equations. Developing Concepts of diploes, conductors, current density, continuity equation & properties of conductor, dielectrics, and concepts of capacitance
- Ability to know the characteristics of static magnetic field associated with steady, time invariant currents & using Biot Savarts law MFI due to various current distributions are calculated & verified using ampere circuital law
- Ability to explore the forces & torques exerted by magnetic field on various current distributions & determining magnetization, magnetic moments, dipole, scalar, vector magnetic potentials using Laplace equations with boundary conditions & classification of magnetic materials, energy & circuits
- Ability to explore the forces & torques exerted by magnetic field on various current distributions & determining magnetization, magnetic moments, dipole, scalar, vector magnetic potentials using Laplace equations with boundary conditions & classification of magnetic materials, energy & circuits

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(A1313) FLUID MECHANICS & HYDRAULIC MACHINERY

Objectives
- The purpose of this course is to learn the Fluid properties and fundamentals of Fluid statics and fluid flow
- To introduce the concepts of flow measurements and flow through pipes
- To impart the knowledge on turbo machinery, hydro electric power stations ,pumps and turbines

UNIT I
Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension- vapour pressure and their influence on fluid motion-atmospheric, gauge and vaccum pressure- measurement of pressure-piezometer, U-Tube and Differential Manometers.

UNIT II
Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.
Fluid dynamics: Surface & body forces Euler's & Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

UNIT III
Closed conduit flow: Reynold's experiment-Darcy Weisbach equation-minor losses in pipes-pipes in series and pipes in parallel-total energy line-hydraulic gradient line.
Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

UNIT IV
Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes.
Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

UNIT V
Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.
Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.
Reciprocating pumps: Working, discharge, slip, indicator diagrams.

TEXT BOOKS
1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

REFERENCE BOOKS
1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers

Course Outcomes
- Able to understand fluid statics, kinematics and dynamics.
- Able to understand the momentum principle and its applications in working of hydraulic turbines.
- Able to understand hydro electric power stations and its components.
- Able to analyze performance of hydraulic turbines and pumps.

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(A1401) ELECTRONIC DEVICES AND CIRCUITS

Objectives

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

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

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

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

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

UNIT –III: Bipolar Junction Transistor and UJT :
The Junction Transistor, , Transistor Current Components, , Transistor as an Amplifier, transistor Construction, BJT Operation, symbol, Common base, Common Emitter and Common Collector Configurations, Limits of operation, BJT Specifications, BJT Hybrid model , Determination of H parameters from Transistor characteristics, Comparison of CB, CE, and CC amplifiers configurations, UJT and Characteristics.

UNIT- IV: Transistor Biasing and Stabilization:
Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector – Emitter feedback bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis of a transistor amplifier circuit using h- parameters.

UNIT- V: Field Effect Transistor and FET Amplifiers
Field Effect Transistor: The Junction Field Effect Transistor (Construction, principle of operation, Symbol)- Pinch-off Voltage-Volt-Ampere characteristics, The JFET small signal model, MOSFET (Construction, principle of operation, Symbol), MOSFET Characteristics in Enhancement and Depletion modes.

FET Amplifiers: FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, Biasing of FET, FET as Voltage Variable Resistor, Comparison of BJT and FET.
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TEXT BOOKS
1. Millman's Electronic Devices & Circuits-J. Millman, C.C. Halkais & Satyabrata Jit, 2 Ed., 1998, TMH.
2. Electronic Devices & Circuits- Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices & Circuits- David A. Bell, 5 Ed, Oxford

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

Course outcomes:

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

- Understand and analyze the different types of diode, operation and its characteristics.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design biasing circuits using diode and transistors.
- To analyze and design diode application circuits, amplifier circuits and oscillators employing BJT, FET devices.

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(A1203)ELECTRICAL MACHINES - I

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

UNIT – I: Electromechanical Energy Conversion
Electromechanical Energy conversion – forces and torque in magnetic field systems – energy balance – energy and force in a singly excited magnetic field system, determination of magnetic force - co-energy – multi excited magnetic field systems.

UNIT – II 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
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 – III: 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 Generators
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 – IV: D.C. Motors & Speed Control Methods
D.C Motors – Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation.
Speed control of D.C. Motors
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 – V: 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. Electric Machines – by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 7th Edition 2005.
2. Electrical Machines – P.S. Bimbra., Khanna Publishers

REFERENCE BOOKS
1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers
2. Electrical Machines -S.K. Battacharya,
3. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd edition, 2004.
4. Electric Machinery – A. E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th editon

Course Outcomes
- Able to know the electromechanical energy conversions for different excited systems
- Acquire the knowledge of constructional features, types, operation of DC generators
- Performance of different DC generators can be analyzed with the characteristics.
- Able to understand the operation of DC motors and its characteristics
- Able to understand different types of speed control methods of DC motor
- Losses and efficiency of DC machines can be determined by conducting direct and indirect tests

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(A1317) FLUID MECHANICS & HYDRAULIC MACHINERY LAB

Objective

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aerofoil model.

Any ten of the above experiments are to be conducted

Course outcomes

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(A1405) ELECTRONIC DEVICES AND CIRCUITS LAB

Objective

PART A: (Only for viva voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

1. Identification and Specifications, testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards. PCBs
2. Identification, and Specifications, testing of Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT.
3. Study and operation of
   i. Multi meters (Analog and Digital)
   ii. Function Generator
   iii. Regulated Power Supplies
   iv. CRO.

PART B: (For Laboratory examination - Minimum of 10 experiments)

1. Forward & Reverse Bias Characteristics of PN Junction diode characteristics.
2. Zener diode characteristics and Zener as Voltage regulator.
3. Input & Output characteristics of Transistor in CB configurations and h-parameter calculations.
4. Input & Output characteristics of Transistor in CE configurations and h-parameter calculations
5. Half wave Rectifiers with & without filters.
6. Full wave Rectifiers with & without filters.
7. FET characteristics
8. Design of self - bias circuit
9. Frequency response of CC Amplifier
10. Frequency response of CE Amplifier (Emitter Follower).
11. Frequency response of Common Source FET amplifier.
12. SCR characteristics.
13. UJT characteristics.

PART C: Equipment required for Laboratories:

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

Course outcomes

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(A1208) POWER SYSTEMS-I

Objective
Electrical Power plays significant role in day to day life of entire mankind. This course concerns the generation and distribution of power along with the economic aspects.

UNIT-I: Thermal &Hydro Power Stations
Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses.- Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.
Hydro Electric Power station: Elements of hydroelectric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area: head and efficiencies. Classification of turbines, impulse and reaction turbines Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube-theory-functions and efficiency

UNIT-II: Gas and Nuclear Power Stations
Nuclear Power Stations: Nuclear Fission and Chain reaction.- Nuclear fuels.- Principle of operation of Nuclear reactor.-Reactor Components: Moderators, Control rods, Reflectors and Coolants.- Radiation hazards: Shielding and Safety precautions.- Types of Nuclear reactors and brief description of PWR, BWR and FBR.
Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)

UNIT-III: Distribution Systems
D.C. Distribution Systems: Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over-Head Distribution Systems- Requirements and Design features of Distribution Systems-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed at one end and at both the ends (equal/unequal Voltages) and Ring Main Distributor.

A.C. Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and referred to respective load voltages.

Unit –IV: Substations, Power factor and Voltage Control
Substations: Classification of substations: **Air insulated substations** - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.
Gas insulated substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.
Power factor and Voltage Control: Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive kVAR using static Capacitors-Most economical p.f. for constant kW load and constant kVA type loads, Numerical Problems.
Dependency of Voltage on Reactive Power flow.- Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers

UNIT-V: Economic Aspects of Power Generation
Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.
Tariff Methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods and Numerical Problems

TEXT BOOKS
1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.

REFERENCE BOOKS
1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.
4. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

Course Outcomes

- Able to understand the operation and design of different power plant.
- To understand the factors involved in the designing of a DC and AC distribution systems based on its classification
- To understand the operation maintenance of different substations and load sharing .
- Able to understand the causes for low power factor, voltage drop and methods to improve them
- Capable of understanding the different factors involved in economizing power generation and different characteristics

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(A1209) ELECTRICAL MACHINES-II

Objective
As an extension of Electrical machines I course this subject facilitates to study the performance of Transformers and Induction motors which are the major parts of industrial drives and agricultural pump sets.

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

UNIT – III Auto & Polyphase transformers
Auto transformers-equivalent circuit-comparison with two winding transformers.
Polyphase Transformers
Polyphase transformers-Polyphase connections – Y/Y,Y/D,D/Y,D/D and open Delta Third harmonics in phase voltages-three winding transformers-tertiary windings-determination of Zp,Zs, and Zt transients in switching-off load and on load tap changing. Scott connection

UNIT- IV: Three phase Induction Motors
Three 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.
Characteristics of Induction Motors
Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation-expressions for maximum torque and starting torque-torque slip characteristic-double cage and deep bar rotors-equivalent circuit-phasor diagram-crawling and cogging.

UNIT- V: Circle Diagram of Induction Motors
Circle diagram-no load and blocked rotor tests-predetermination of performance-methods of starting and starting current and torque calculations.
Speed Control Methods
Speed control-change of frequency; change of poles and methods of consequent poles; cascade connection, injection of an emf into rotor circuit(qualitative treatment only)-induction generator-principle of operation.

TEXT BOOKS
1. Electric Machines – by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 7th Edition 2005.
2. Electrical Machines – by P.S. Bimbra, Khanna Publishers.

REFERENCE BOOKS:
1. The Performance and Design of A.C.Machines – by M.G.Say, ELBS and Ptiman & Sons.
2. Electric Machinery – by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies, 5th edition, 1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
4. Electromachanics-II, S.Kamakashiah, Right Publishers

Course Outcomes
- Acquire the knowledge of constructional features & operation of 1phase transformer and its equivalent circuit.
- Acquire the knowledge of the performance of the transformer by calculating efficiency, regulation with different tests, variation of iron losses with voltage and frequency.
- Able to understand and compare autotransformers with 2 winding transformers and the performance of a 3-phase transformer.
- Able to understand the constructional features and operation of poly phase Induction Motor.
- Acquire the knowledge of torque production and variation of torque with slip, the performance Characteristics and its predetermination with circle diagram.
- Acquire the knowledge different speed control strategies of induction motor

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(A1210) NETWORK THEORY-II

Objective
This course is an extension of Network Theory –I. The emphasis of this course is laid on the Three phase Circuits. , transient analysis, Network functions and parameters, filters and Fourier analysis of circuits

UNIT- I: 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 Measurement of active and reactive power.

UNIT-II: D.C & AC Transient Analysis
Transient response of R-L,R-C,R-L-C circuits (Series and parallel combination) for D.C & AC excitation-Initial conditions-solution method using differential equation and Laplace transforms.

UNIT-III: Network Functions
The concept of Complex Frequency ,physical Interpretation of Complex Frequency, Transform Impedance and Transform Circuits, Series and parallel Combination of Elements, Terminal Pairs or Ports, Networks Functions for the One-port and Two-port, Poles and Zeros of Network Functions, Significance of poles and Zeros, Properties of Driving Point Functions, Properties of Transfer Functions, Necessary Conditions for Driving Point Functions, Necessary Conditions for Transfer Functions, Time Domain Response from Pole Zero Plot

UNIT-IV: Network Parameters & Filters
Two port network parameters –Z., Y, ABCD and hybrid parameters and their relations
Cascaded networks, concept of transformed network-2port network parameters using transformed variables.
Filters
Low pass, High pass, Band pass, Band elimination, prototype filter design

UNIT-V: Fourier analysis of A.C Circuits
The Fourier theorem, consideration of symmetry, exponential form of Fourier series, line spectra and phase angle spectra, Fourier integrals and Fourier transforms, properties of Fourier transforms.

TEXT BOOKS
1. Electric circuits by A.Chakrabarthy, Dhanipat Rai & Sons
2. Circuits & Networks by A.Sudhakar and Shyammohan S Palli,Tata McGraw-Hill
3. Electric circuit analysis by B.Subrahmanyam, I.K.international

REFERENCE BOOKS
1. Network Analysis by M.E.Van Valkenberg
2. Electric circuit Analysis by C.L.Wadhwa,New Age international
4. Electric circuits by David A.Bell,Oxford University press
5. Basic circuit analysis by D.R.Cunningham & J.A.Stuller,Jaico Publicaitons.
6. Electric Circuit theory by K.Rajeswaran,Pearson Education 2004.

Course Outcomes
- Ability to learn basics of 3 φ circuits, star & delta connection & their analysis on balanced & unbalanced loads to calculate active & reactive power
- Ability to learn transients for basic R-L, R-C, R-L-C circuits with initial condition using time & frequency domain analysis for D.C & A.C Excitation.
- Ability to develop the basic concepts of complex frequency, network functions, poles & Zeros, Driving Point Functions & Time Domain Responses from Pole Zero Plot
- Study of network Parameters & their interrelations & developing transformed Network for 2 port networks using transformed variables
- Ability to differentiate various types of filters, design concepts & analysis of A.C. circuits

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(A1404) SWITCHING THEORY AND LOGIC DESIGN

Objective

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

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operation using combinational logic circuits.
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using Flip-Flops.

UNIT I: Number System And Boolean Algebra And Switching Functions

Number Systems, Base Conversion Methods, Complements of numbers, Codes – binary codes, Binary Coded Decimal code and its properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.
Boolean Algebra: Basic theorems and properties - Switching Functions, Canonical and Standard forms-Algebraic simplification Digital Logic Gates, Properties of XOR gates &Universal gates-Multilevel NAND/NOR realizations.

UNIT-2: Minimization And Design Of Combinational Circuits

Introduction, The Minimization with Theorem, The Karnaugh Map Method, Five and Six Variable Maps , Prime and Essential Implications, Don't Care Map Entries, Using Map for SIMPLIFYNG TABULAR METHOD, Partially Specified Expressions Multi Output minimization and combinational design, Arithmatic Circtuits, Comparator, Multiplexer, Code-converters, Wired Logic ,Tri State bus System, Practical Aspects related to Combinational Logic Design, Hazards and hazard free realizations.

UNIT-3: Sequential Machines Fundamentals

Introduction, Basic Architectural Distinctions between combinational and sequential circuits.The Binary Cell, Fundamentals of Sequential Machine Operations, The Flipflop, D-Latch Flipflop, The clocked T-flipflop, the clocked J-K flipflop, Design of a clocked flipflop, Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration, Clock Skew.

UNIT-4: Sequential Circuit Design And Analysis

Introduction, State Diagram, Analysis of synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines , Design Aspects, State Reduction , Design Steps, Realization using Flip-Flops. Counters –Design of single mode counter, ripple counter, ring counter, shift register, shift register sequences, ring counter using shift register.

UNIT 5: Sequential Circuits

Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.
Algorithmic State Machines: salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

TEXT BOOKS

1. Switching & Finite Automata theory - ZviKohavi, & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS

1. Introduction to switching design and logic design _ Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc
2. Digital fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.
3. Digital logic design- Ye Brian and Holds Worth, Elsevier.
4. Fundamentals of Logic Design - Charles H. Roth, Thomson Publications, 5th Edition, 2004. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.
5. Digital Logic and state machine design – Comer, 3rd, oxford, 2013.

Course Outcomes

Upon completion of the course, students should posses the following skills

- Be able to manipulate numeric information in different forms, e.g., different bases , signed integers, various codes such as ASCII, gray and BCD
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions
- Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits
- Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/ building blocks to build larger more complex circuits.

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(A1442) ELECTRONIC CIRCUITS

Objective

Electrical circuits plays significant role in day ti day life of entire mankind. This course deals with the concept of different types of amplifiers, oscillators, vibrators, Clippers, clampers, switching characteristics of various semiconductor devices, linear wave shaping and frequency response of bipolar junction transistor and field effect transistor.

UNIT-I: Single Stage Amplifiers Design And Analysis

Review of Single Stage CE, CB,CC & CS amplifiers-Classification of Amplifiers, Distortion in amplifiers-Approximate analysis, CE, CB, CC amplifiers comparison.

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

UNIT-II:

BJT & FET Frequency Response: Logarithms, Decibels, General frequency considerations-Low frequency analysis-Low frequency response of BJT amplifiers - Low frequency response of FET amplifiers – Miller effect capacitance-High frequency response of BJT amplifiers-Square wave testing.

UNIT-III:

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

Cippers and Clampers: Diode clippers, Transistor clippers, clipping at two independent levels,Transfer characteristics of clippers, Emitter coupled clipper, comparator, Applications of voltage comparators. Clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits and effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT-IV:

Large Signal Amplifiers: Class A Power Amplifier, Maximum value of efficiency of class-A Amplifier, Transformer Coupled Amplifier, Push- Pull Amplifier, Complementary Symmetry circuits (Transformer less Class B Power Amplifier)-Phase inverters, Transistor power Dissipation, Thermal Runaway, Heat Sinks.

Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, and ramp inputs.

UNIT-V:

Switching Characteristics of Devices: Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of Transistor, Saturation Parameters of Transistor and their variation with temperature, design of transistor switch, Transistor- switching times.

TEXT BOOKS:

1. Electronic Devices and Circuit Theory - Robert L.Boylestad, Louis Nashelsky, 9 Ed., 2007, PE
2. Electronic Devices and Circuits - S. Salivahanan, N.Suresh Kumar, A Vallavaraj, 2 Ed., 2008, TMH Copanies.
3. Solid State Pulse circuits - David A. Bell, 4th Edn., PHI

REFERENCES:

1. Introductory Electronic Devices and Circuits(Conventional flow version)-Robert T. Paynter,7th Edition,2009,PEI.
2. Electronic Devices and Circuits- Anil K. Maini, Varsha Agarwal, 1 Ed,Wiley .
3. Pulse, Digital &Switching Waveforms by Jacob. Millman, Harbert Taub and Mothiki S Prakash rao,2nd edition 2008, Tata McGraw-Hill Companies.

Course Outcome

After going through this course the student gets a thorough knowledge on various electronic circuits like oscillators, multi-vibrators, frequency response analysis , clippers and clampers, switching characteristics of semiconductor devices, concept of wave shaping, with this knowledge they can apply sufficient knowledge for solving real world problems.

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(A1218) CONTROL SYSTEMS

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

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

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

UNIT-III: Time Response Analysis
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.
Stability Analysis in S-Domain
The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability
Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci. Basics of PID Controllers

UNIT –IV: Frequency Response Analysis
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots-Stability Analysis-Applications of Nyquist criterion to find the stability.

UNIT – V: State Space Analysis of Continuous Systems
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

TEXT BOOKS
1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International
3. (P) Limited, Publishers, 2nd edition.

REFERENCE BOOKS
1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. "Modeling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

Course Outcomes
- Able to know the basics of control systems and their classifications
- Able to design the mathematical models of Electrical and mechanical systems
- Capable of determining the performance characteristics of any linear system with respect to time and frequency
- Capable of determining the stability and design of classical controllers' using time and frequency domain analysis
- Capable of realizing the linear systems in state space model and estimate the controllability and observability of linear systems using state space analysis

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(A1211) ELECTRICAL MACHINES LAB – I

Objective

This lab introduces the direct and indirect tests on DC machines to know the performance and Also the different speed control techniques will be done practically.

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

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.

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

9. Brake test on DC shunt motor. Determination of performance curves.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separation of losses in DC shunt motor.

Course Outcomes

- Able to know the process of emf induced in DC generator**.**
- Able to analyze the characteristics of different types of DC generators by load test.
- Able to know the performance of DC machines through different tests.
- Able to predetermine the efficiency of DC M/G by conducting Hopkinson's test
- Able to draw the performance curves of a different DC motors by brake tests.

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(A1212) ELECTRICAL CIRCUITS & SIMULATION LAB

Objective
This course provides the indepth knowledge of theorems by verifying practically. It also introduces the resonance phenomena and power measurement in AC circuits

PART-A: ELECTRICAL CIRCUITS

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

PART-B: PSPICE SIMULATION

1. Simulation of DC Circuits
2. DC Transient response
3. Mesh Analysis
4. Nodal Analysis

NOTE:

- **PSPICE** software Package is necessary
- **Eight** experiments are to be conducted from PART-A and any **Two** from PART-B

Course Outcomes

- Able to determine the thevenenin's voltage & resistance of a circuit, able to determine the Norton's current and resistance of a circuit.
- Able to solve a multi source network using super position theorem.
- Able to determine Z, Y and H, ABCD Parameters of a circuit.
- Able to determine active power and reactive power for various loads.
- Able to solve many unknown resources in a complex circuit using Simulation(PSPICE)
- Able to determine load resistance in a circuit to transfer maximum power using maximum power transfer theorem.

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(A1005) SOFT SKILLS AND PROFESSIONAL ETHICS

MODULE 1. BUSINESS COMMUNICATION SKILLS

- English Language Enhancement
- The Art of Communication

OBJECTIVE

- The student will gain a functional understanding of basic English Grammar
- Practice language skills to eliminate errors in pronunciation and sentence construction
- Understand and enhance interpersonal communication proces

MODULE 2. INTRAPERSONAL & INTERPERSONAL RELATIONSHIP SKILLS

- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

OBJECTIVE

- The student will understand the importance of and the various skills involved in developing enriching interpersonal relationships
- Be more aware of his/her own self – confidence, values
- Understand and handle emotions of self and others.
- Understand the necessity and importance of working together as a team
- Learn how to go about being a good team player and form an effective team
- Have put their team building skills to test in the various activities to understand where they stand and improve themselves with each succeeding activity.

MODULE 3. CAMPUS TO COMPANY

- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

OBJECTIVE

- The student will understand what constitutes proper grooming and etiquette in a professional environment.
- Have some practical tips to handle him/her in a given professional setting.
- Have practiced the skills necessary to demonstrate a comfort level in executing the same.

MODULE 4. GROUP DISCUSSIONS, INTERVIEWS AND PRESENTATIONS

- Group Discussions
- Interviews
- Presentations

OBJECTIVE

- The student will be able to appreciate the nuances of the Group Decision-making process.
- Understand the skills tested and participate effectively in Group Discussions.
- Learn the basics of how to make an effective presentation and have numerous practice presentations in small groups and larger audiences.
- Attend any type of interview with the confidence borne out of knowledge gained and practice sessions.

MODULE 5. ENTREPRENEURIAL SKILLS DEVELOPMENT

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

OBJECTIVE

- The student will be able to set specific measurable goals for themselves in their personal and/or professional life.
- Understand the skills and the intricacies involved in starting an entrepreneurial venture.

COURSE OUTCOMES

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

- Understand the basicsof English Grammar and enhance interpersonal communication process.
- Be a good team player and form an effective team.
- Know how to handle himself/herself in any given professional setting.
- Handle any type of Interview with confidence.
- Understand the skills and intricacies involved in starting an entrepreneurial venture

REFERENCE BOOKS

1. UNLEASH the power within….Soft Skills – Training Manual (Infosys Campus Connect)

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(A1217) POWER SYSTEMS-II

Objective
This course is an extension of Power systems-I . It deals with basic theory of transmission lines modelling and their performance analysis. Also this course gives emphasis on mechanical design of transmission lines, cables and insulators.

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 for symmetrical & Asymmetrical Networks, 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, Incident, Reflected and Refracted Waves -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT- III: Power System Transients and Factors Governing the Performance of Transmission line
Types of System Transients - Travelling or Propagation of Surges - 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)

Various Factors Governing the Performance of Transmission line: Skin and Proximity effects - Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss.

UNIT-IV: Mechanical Design and Line Insulators
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. Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

UNIT-V: 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 - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

TEXT BOOKS
1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.

REFERENCE BOOKS
1. Power system Analysis-by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. Power System Analysis by Hadi Saadat – TMH Edition.
4. Electrical Power Transmission system engineering Analysis and design by Turan Gonen, CRC press (Taylor & Francis Group) Special Indian Edition,2/e.

Course Outcomes
- Able to derive the mathematical representations of capacitance and inductance for various transmission
- Able to estimate the efficiency and regulation of various types of transmission systems
- Capability to understand mechanical design (sag, span length, insulators) of transmission lines.
- Able to know various effects associated with transmission lines.
- Able to know the detailed information of underground cables, alternative to overhead transmission

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(A1021) MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS

Objectives

- The students should be able to apply the principles of economics in business decision making process, Demand analysis, Elasticity of Demand and Demand forecasting.
- Study cost concepts and Break Even Analysis.
- Describe "Business" and new economic environment and also the capital and its significance and capital budgeting techniques.
- Describe the accounting concepts and conventions and financial statements to be prepared for any business.
- Describe the accounting concepts and financial analysis through ratios.

UNIT I: Introduction & Demand Analysis:
Definition, Nature and Scope of Managerial Economics Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Elasticityof Demand: Definition, Types, Measurement and Significance ofElasticityof Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

UNIT II: Theory of Production and Cost Analysis:
Production Function Isoquants and Is costs, MRTS, Least Cost Combination of Inputs,Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.
Cost Analysis: Cost concepts, Opportunity cost, fixed vs. Variable costs, explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)-Managerial Significance and limitations of BEA.

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

UNIT IV: Capital and Capital Budgeting:
Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net PresentValue Method (simple problems)

UNIT V: Introduction to Financial Accounting& Financial Analysis:
Accounting concepts and conventions-Introduction IFRS-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios.Conversion of Ratios into preparation of Financial Statements.

TEXT BOOKS

1. S.ASiddiqui&A.SSiddiqui Managerial Economics& Financial Analysis, New Age International Publishers, Hyderabad 2013.
2. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2009.

REFERENCE BOOKS

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. CrisLewis, Managerial Economics, Person, 2012.
3. Lipsey&Chrystel, Economies, Oxford University Press, 2012.
4. Dwivedi: Managerial Economics, Vikas2012.
5. Shailaja&Usha: MEFA, University Press, 2012.
6. Aryasri: Managerial Economics & Financial Analysis, TMH, 2012.

Course Outcomes

- To understand the results of the managerial decisions taken in business organization and study the different types of elasticity of demand.
- Understand and apply Production Function formula in determining increasing, constant and decreasing returns, the price, output determination under perfect competition, monopoly.
- To know the requirements for starting a business and understand the effect of the principles of LPG in the new economic environment, the importance of capital in starting a business unit.
- Understand the accounting concepts and conventions followed in double entry book keeping system and know the preparation of final accounts.
- Understand the application of different financial ratios to study the liquidity, solvency and profitability of a business concern.

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(A1219) ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Objective
This course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements.

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

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

UNIT –III: Measurement of Power & Energy
Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – trivector meter, maximum demand meters.

UNIT – IV: D.C & A.C Bridges
Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge. Wien's bridge – Schering Bridge.

UNIT-V: Transducers & Oscilloscope
Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle of operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, guage factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

Oscilloscope
Cathode ray oscilloscope-Cathode ray tube-time base generator-horizontal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-

TEXT BOOKS
1. Electrical & Electronic Measurement & Instruments by R.K Rajput, S.Chand & Company Ltd.
2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.

REFERENCE BOOKS
1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall
3. Electrical Measurements by Harris.
4. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.

Course Outcomes
- Able to understand different types of instruments and their torques
- Able to understand the principle of operation & construction of Instrument transformers, Watt meters, Energy meters and Potentiometers
- Able to know the different types of bridges to measure the Resistance, Inductance and Capacitance
- Able to understand operation of CRO & different types of transducers characteristics and applications

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(A1414) LINEAR AND DIGITAL IC APPLICATIONS

Course Objectives

The main objectives of the course are:

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

UNIT-I: Operational Amplifier

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

UNIT-II: OP-AMP, IC 555 & IC 565 Applications

Introduction to Active Filters, Characteristics of Band Pass, Band Reject and All Pass Filters, Analysis of 1st Order LPF & HPF Butterworth Filters, Waveform Generators- Triangular, Sawtooth, Square wave, IC 555 Timer- Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL- Block Schematic, Description of Individual Blocks, Applications.

UNIT-III: Data Converters

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

UNIT-IV: Digital Integrated Circuits

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

UNIT-V: Sequential Logic ICs and Memories

Familiarity with Commonly Available 74XX & CMOS 40XX Series ICs - All Types of Flip-Flops, Synchronous Counters. Decade counters, Shift Registers.

Memories- ROM Architecture, Types of ROMs & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS

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

REFERENCE BOOKS

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

Course Outcomes

On completion of this course, the students will have:

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Understanding of the different families of digital integrated circuits and their characteristics.
- Also students will be able to design circuits using operational amplifiers for various applications.

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(A1220) POWER ELECTRONICS

Objective
With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

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

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

UNIT – III: AC Voltage Controllers, Traic & Cyclo Converters
AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads –Derivation of Average & RMS load voltage, current and power factor wave forms- Numerical problems
TRAIC- Modes of operation of TRAIC
Cyclo converters – Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

UNIT – IV: Choppers
Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression
Morgan's chopper – Jones chopper, Voltage and Current Commutated Choppers, and Oscillation chopper (Principle of operation only) Waveforms — AC Chopper – Problems.

UNIT – V: Inverters
Inverters – Single phase inverter – Basic series inverter – Basic parallel inverter– Waveforms –Voltage Source Inverter, Current Source Inverter– Mc Murray and Mc Murray – Bedford inverters - Control techniques for inverters - Stepped Wave & Pulse width modulation techniques and Comparison – Numerical problems.

TEXT BOOKS
1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.
2. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, Publishers
3. P.S.Bhimbra."Power Electronics',khanna publications

REFERENCE BOOKS
1. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics - by V.R.Murthy , 1st edition -2005, OXFORD University Press
3. Power Electronics-by P.C.Sen, Tata Mc Graw-Hill Publishing.
4. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradra, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.

Course Outcomes
- Able to understand the operation and performance characteristics of various semi conductor devices and their applications
- Capable to apply controlled conversion of 1phase, 3 phase AC voltage to DC voltage for various load applications
- Capable to apply controlled conversion of 1phase, 3 phase AC voltage to DC voltage for various load applications
- Capable to regulate the DC voltage using current commutated and voltage commutated chopper.
- Able to understand the conversion of DC voltage to AC voltage using different modulation techniques

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(A1221)ELECTIC MACHINES-III

Objective
This subject is an extension of previous machines courses. It deals with the detailed analysis of Synchronous generators and motors which are the prime source of electrical power generation and its utilities. Also concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

UNIT- I*:* Synchronous Generators
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 reactances.

UNIT – IV: Synchronous Motors
Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed.
Power Circles: Excitation and power circles- Hunting and its suppression – methods of starting- synchronous induction motor

UNIT – V: Single Phase Motors &Special Motors
Single phase Motors: Single phase induction motor – Constructional features-Double revolving field theory – Equivalent circuit, split-phase motors –capacitor start capacitor run motors– shaded pole motor.
Principle & performance of A.C. Series motor-Universal motor – stepper motor.

TEXT BOOKS
1. Electric Machines – by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 7th Edition 2005.
2. Electrical Machines – by P.S. Bimbra, Khanna Publishers.

REFERENCE BOOKS
1. The Performance and Design of A.C.Machines – by M.G.Say, ELBS and Ptiman & Sons.
2. Electric Machinery – by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies, 5th edition, 1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
4. Electro mechanics-III (Synchronous and single phase machines), S.Kamakashiah, Right Publishers

Course Outcomes
- Able to understand the constructional details, operation and performance of alternator
- Able to understand the constructional details, operation and performance of alternator
- Able to analyze operation and starting methods of synchronous motor.
- Able to understand the operation of different types of single phase induction motor and special motors like
- ACF Series motor, Universal motor, stepper motor and shaded pole motor.

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(A1222) ELECTRICAL MACHINES LAB – II

Objective

This lab is an extension to Electrical Machines –I lab which facilitates to know the performance of transformers, Induction motors and synchronous motors

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

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

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

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

Course Outcomes

- Able to analyze the performance of transformers and find different losses by conducting different tests
- Able to convert 3-Ø supply to 2-Ø supply using scott connections of transformers
- Able to find the performance of a 3-Ø & 1-Ø induction motor using different tests
- Able to find the regulation of 3-Ø alternator using different methods.
- Able to draw the different curves of synchronous motor.
- Able to determine Xd & Xq of a salient pole synchronous machine

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(A1223) CONTROL SYSTEMS & SIMULATION LAB

Objective

This course aim to enforce the knowledge of different controlling techniques in open loop and closed loop systems. It also introduces the concept of MATLAB to simulate different frequency response plots

Any Eight of the following experiments are to be conducted:

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. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of DC generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor

Any two simulation experiments are to be conducted:-

3. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
4. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
5. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
6. State space model for classical transfer function using MATLAB – Verification.

REFERENCE BOOKS

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.

Course Outcomes

- Able to analyze the Time response of Second order System and Effect of P, PD,PI, PID controller on a second order system.
- Able to determine the Transfer function of DC motor and DC generator.
- Able to analyze the effect of feedback on DC Servo motor, Characteristics of AC servo motor, Synchros and Magnetic amplifier.
- Able to understand the Temperature controller using PID.
- Able to perform the PSPICE simulation of Op-Amp based integrator and differentiator circuits
- Able to perform the Stability analysis (Bode, Root Locus, Nyquist) of linear time invariant system and design the State Space model for classical transfer function using MATLAB

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(A1011) ANALYTICAL SKILLS - I

Quantitative Aptitude

- Number System
- LCM and HCF
- Averages
- Simple Equations
- Ratios & Proportions
- Partnerships
- Percentages
- Profit & Loss
- Time & Work
- Time & Distance
- Simple and compound interest
- Permutations & Combinations
- Probability

REFERENCE BOOKS

1. QuantativeApptitude by R.S. Agarwal.

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(A1224) POWER SEMICONDUCTOR DRIVES

Objective
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.

UNIT – I: Control of DC motors through phase controlled Converters
Introduction to Thyristor controlled Drives, Single Phase semi and 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 semi and fully controlled converters connected to d.c separately excited and d.c series motors – 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 – Continuos 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
Stator side control: 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)
Rotor side control: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages applications – problems

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

TEXT BOOKS
1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI.

REFERENCE BOOKS
1. Power Electronics – MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company,1998
2. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
3. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publilcations.
4. A First course on Electrical Drives – S K Pillai New Age International(P) Ltd. 2nd Editon.

Course Outcomes
- Able to understand the conversion of single phase & three phase AC to DC voltage for the control of DCseparately excited & series Motors
- Acquire the knowledge of different quadrants operation with dual converters & the closed loop operation of DC Motors
- Capable o control chopper fed DC separately excited & series Motors in different quadrants & to draw the different characteristics.
- Able to understand the Induction Motor control by stator voltage control, stator frequency control & slip power recovery scheme with suitable converters
- Able to understand the operation, characteristics, applications, advantages & closed loop operation of self & separately controlled synchronous Motors by CSI & VSI Cycloconverters.

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(A1020) ENVIRONMENTAL STUDIES

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

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

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

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

UNIT-IV: Environmental Pollution and Control Technologies: Environmental Pollution
Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary andTertiary. Overview of air pollution control technologies, Concepts of bioremediation.
Global Environmental Problems and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montreal Protocol.

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

TEXT BOOKS:
1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:
1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning PrivateLtd. New Delhi.
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI LearningPvt. Ltd.
3. Environmental Science by Daniel B.Botkin& Edward A.Keller, Wiley INDIA edition.
4. Environmental Studies by AnubhaKaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications

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

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(A1226) POWER SYSTEMS III

Objective
This course introduces all varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards. It emphasize on Neutral grounding for overall protection.

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

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

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

UNIT –IV: Feeder and Bus-Bar Protection, Protection against over voltages
Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.
Protection of Bus bars – Differential protection.
Protection against over voltages
Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

UNIT – V: Neutral Grounding
Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

TEXT BOOKS:
1. Switchgear and Protection – by Sunil S Rao, Khanna Publlishers
2. Power System Protection and Switchgear by Badari Ram , D.N Viswakarma, TMH Publications

REFERENCE BOOKS:
1. Fundamentals of Power System Protection by Paithankar and S.R.Bhide., PHI, 2003.
2. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
3. Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 3nd editon
4. A Text book on Power System Engineering by B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, Dhanpat Rai & Co.

Course Outcomes

- Capability to understand the operation, ratings & specifications of different types of Circuit Breakers & Auto reclosures.
- Able to understand the necessity, construction & operation of unalike relays with applications.
- Able to understand the necessity, construction & operation of unalike relays with applications.
- Capable to know the adverse effects of ungrounded systems, necessity of grounding & methods of grounding

systems

- Able to understand the causes for over voltages & protection against over voltages using various devices with specifications

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(A1227) COMPUTER METHODES IN POWER SYSTEMS

Objective
This course introduces formation of Z bus of a transmission line, power flow studies by various methods. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

UNIT –I: Power System Network Matrices
Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems.
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).- Modification of Z_{Bus} for the changes in network (Problems)

UNIT –II: Power flow Studies: Load Flows
Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations –
Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, 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.
Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.
Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC load Flow

UNIT – III: Short Circuit Analysis
Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.
Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

UNIT –IV: **Symmetrical Component Theory**
Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.
Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.
Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT –V: Power System Stability Analysis
Steady State Stability Analysis: 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.
Transient State Stability Analysis
Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation.- Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS
1. Computer Techniques in Power System Analysis by M.A.Pai, TMH Publications.
2. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing company, 2nd edition.

REFERENCE BOOKS
1. Computer Methods in Power System Analysis,Stagg and El-Abiad, McGraw Hill international student edition
2. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
3. Power System Analysis by Hadi Saadat – TMH Edition.
4. Power System Analysis by B.R.Gupta, Wheeler Publications.
5. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill

Course Outcomes
- Able to know the basic of graph theory and bus admittance matrix formation
- Able to write the algorithm for modification of bus impedance matrix for addition of link and branch
- Able to know the necessity of power flow study and derive the solution of load flow by gauss seidile method and Newton rapson method

- Able to know the per unit system, sequence networks and analysis the symmetrical, unsymmetrical faults
- Able to analyse the transient and steady state stability and methods to improve the stability

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(A1420) DIGITAL SIGNAL PROCESSING

Objectives

This course is an essential course that provides design techniques for processing all type of signals in various fields. The main objectives are:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous – time and discrete – time signals and systems.
- To study fundamentals of time, frequency and Z – plane analysis and to discuss the inter - relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- The impetus is to introduce a few real – world signal processing applications.
- To acquaint in FFT algorithms, Multi – rate signal processing techniques and finite world length effects.

UNIT I: Introduction: Introduction to Digital Signal Processing
Discrete time signals & sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems.
Realization of Digital Filters: Applications of Z-transforms, solution of difference equations of digital filters, System function ,Stability criterion, Frequency response of stable systems, Realization of digital filters – Direct, Canonic, Cascade and Parallel forms.

UNIT –II: Discrete Fourier series
DFS representation of periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT: Over – lap Add method, over – lap Save method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 decimation-in-time and decimation – in-frequency FFT Algorithms, Inverse FFT, and FFT with general Radix-N.

UNIT- III: IIR Digital Filters
Analog filer approximations- Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Step and Impulse invariant techniques, bilinear transformation method, spectral transformations.

UNIT- IV: FIR Digital Filters
Characteristics of FIR Digital Filters, Frequency response, Design of FIR Filters: Fourier Method, Digital Filters using Window techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT- V: Multi rate Digital Signal Processing
Introduction, down sampling, Decimation, Up sampling, interpolation, sampling rate conversion.
Finite word Length effects: Limit Cycles, Overflow oscillations, round-off noise in IIR digital filters, Computational output round off Noise, Methods to prevent overflow, Tradeoff between Round off and overflow noise, Dead band effects.

TEXT BOOKS:
1. Digital Signal Processing, Principles, Algorithms, and Applications, John G.Proakis, Dimitris G.Manolakis, Pearson Education /PHI, 2007.
2. Discrete Time Signal Processing - A.V. Oppenheim and R.W.Schaffer, PHI, 2009.
3. Fundamentals of Digital Signal Processing- Loney Ludeman, John Wiley, 2009.

REFERENCES:
1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008.
2. Fundamentals of Digital Signal Processing Using MATLAB – Robert J.Schilling, Sandra L.Harris, Thomson, 2007.
3. Digital Signal Processing - S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009.
4. Discrete Systems and Digital Signal Processing with MATLAB – Taan S.EIAli, CRC press, 2009.
5. Digital Signal Processing – A practical approach, Emmanuel C.Ifeachor and Barrie W.Jervis, 2nd Edition Pearson Education, 2009.
6. Digital Signal Processing - Nagoor kani, TMG, 2012.

Course Outcomes

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

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

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(A1510) OBJECT ORIENTED PROGRAMING THROUGH JAVA
(OPEN ELECTIVE)

Objectives
- To understand object oriented programming concepts and applications in problem solving.
- Learn the Java programming language: its syntax, idioms, patterns, and styles.
- Become comfortable with object oriented programming: Learn to think in objects.
- Learn the essentials of the Java class library, and learn how to learn about other parts of the library when you need them.
- To learn the basics of java console and GUI based programs.
- Introduce event driven Graphical User Interface (GUI) programming.

UNIT- I: Java Programming
History of java, comments, data types, variables, constants, scope and life time of variables, operators, hierarchy expressions, type conversions and casting, enumerated types, control for block scope, conditional statements, loops, break and continue statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access controls, his reference, overloading methods and constructors, recursions, garbage collections, building strings, exploring strings class.

UNIT- II: Inheritance
Inheritance hierarchies super and sub classes, member access rules, super keyword, and preventing inheritance: final classes and methods, the object class and its methods.
Polymorphism: dynamic binding, method overloading, abstract classes and methods. **Interface:** interface vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interfaces references, extending interface.
Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages

UNIT- III: Exception Handling
Dealing with errors, benefits of exception handling, the classification of exceptions, exception hierarchy, checked exceptions and unchecked exception, usage of try , catch, throw, throws, and finally, re-throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.
Multithreading- difference between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer pattern.

UNIT- IV: Event Handling
Events, Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, examples: handling a button click, handling mouse events, Adapter classes.
The AWT class hierarchy, Userinterface components-labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, list panels-scrollpane, dialogs, menubar, graphics, layoutmanager-layout manager types-border, grid, flow, card and grid bag.

UNIT- V:
Introduction to Swing, Swing vs. AWT, Hierarchy for Swing components, Containers-JFrame, JApplet, JDialog, JPanel, Overview of some swing components, JButton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management- Layout manager types- border grid and flow.

Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an Applet, is passing parameters to applets, applet security issues.

TEXTBOOKS:
1. Java the complete reference ,7th edition,Herbert schildt,TMH
2. Understanding oop with Java,updated edition,T.Budd,pearson education

REFERENCES:
1. Java for programming, P.J.Dietel Pearson education (OR) Java: How to Program P.J.Dietel and H.M.Dietel, PHI
2. Object Oriented Programming through java, P.Radha Krishna, Universities Press.
3. Thinking in Java, Bruce Eckel, Pearson Education
4. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.
5. Java Fundamentals- A Comprehensive introduction, Herbert schildtand Dale skrien, TMH

Course Outcomes

- Understanding of OOP concepts and basics of java programming (Console and GUI Based)
- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- The skills to apply OOP and java Programming in problem solving.
- Should have the ability to extend his/her knowledge of java programming future on his/her own.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

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(A1509) DATA BASE MANAGEMENT SYSTEMS
(OPEN ELECTIVE)

Objectives
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To become familiar with the basic issues of transaction processing and concurrently control.
- To become familiar with database storage structures and access technologies.

UNIT- I: Introduction
Data base System Applications, Purpose of Database Systems, View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models – Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator, History of data base systems

Introduction to Data base design and ER diagrams – ER Model - Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with ER model – Conceptual Design for Large Enterprise.
Introduction to the Relational Model, Integrity constraints over Relations, Enforcing Integrity Constraints, Query Relational Data, Logical database Design, Introduction to views- Destroying/ altering tables & Views

UNIT- II: Relational Algebra & Calculus
Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus – Expressive Power of Algebra and calculus.

Form of Basic SQL Query- Examples of SQL Queries – introduction to Nested Queires, Correlated Nested Queries, Set comparison Operators, Aggregate Operators, Null values comparison, using Null values, logical connectives, AND, OR & NOT Impact on SQL constructs, Outer Joins, Disallowing Null Values, and Complex Integrity constraints in SQL Triggers and Active Data bases.

UNIT- III:
Introduction to Schema Refinement – Problems Caused by redundancy, Decompositions – Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms – FIRST,SECOND, THIRD Normal forms – BCNF –Properties of Decompositions- Loss less- join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design – Multi valued Dependencies – FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies

UNIT- IV: Transaction management Transaction Concept
Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability-
Concurrency control- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.
Recovery System- Failure classification, storage structure, Recovery & atomicity, Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of nonvolatile storage-Advance Recovery systems- Remote Backup systems.

UNIT- V: Overview of Storage and Indexing
Data on External Storage, File Organization and Indexing – Clustered Indexes, Primary and Secondary Indexes, Index data Structures – Hash Based Indexing, Tree based Indexing, Comparison of File Organizations. Storing data: Disks and Files: -The Memory Hierarchy – Redundant Arrays of Independent Disks.
Tree Structured Indexing: Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM) B+Trees: A Dynamic Index Structure, Search, Insert, and Delete.
Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible Vs. Linear Hashing.

TEXTBOOKS
1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition, 2006.
3. Fundamentals of Database Systems 5th edition, Ramez Elmasri, Shamkant B.Navathe, Pearson Education, 2008.

REFERENCE BOOKS

1. Database Management System Oracle SQL and PL/SQL, P.K.Das Gupta, PHI.
2. Database System Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Database Systems, A Practical approach to Design Implementation and Management Fourth edition, Thomas Connolly, Carolyn Begg, Pearson education.
4. Database-Principles,Programming,andPerformance,P.O'Neil,E.O'Neil, 2nd Edition Elesevier
5. Fundamentals of Relational Database Management Systems, S.Sumathi, S.Esakkirajan, Springer.
6. Introduction to Database Management, M.L.Gillenson and others, Wiley Student Edition.
7. Database Development and Management, Lee Chao, Auerbach publications, Taylor & Francis Group.
8. Introduction to Database Systems, C.J.Date, Pearson Education.

Course Outcomes

- Demonstrate the basic elements of a relational database management system.
- Ability to identify the data models for relevant problems.
- Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
- Apply normalization for the development of application softwares.

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(A1505) COMPUTER ORGANIZATION
(OPEN ELECTIVE)

Objectives
- To understand basic components of computers
- To explore the I/O organizations in depth
- To explore the memory organization
- To understand the basic chip design and organization of 8086 with assembly language programming

UNIT I:
Basic Computer Organization – Functions of CPU, I/O Units, Memory Instructions: Instruction formats- one address, two addresses, zero addresses and three addresses and comparison: addressing modes with numeric examples: Program Control – status bit conditions, conditional branches instructions, Program Interrupts: Types of Interrupts.

UNIT II:
Input-Output Organizations - I/O Interface, I/O Bus & Interface Modules: I/O Vs Memory Bus, Isolated Vs Memory Mapped I/O, Asynchronous data Transfer- Stobe Control, Hand Shaking: Asynchronous Serial Transfer- Asynchronous Communication Interface, Modes of Transfer Programmed I/O, Interrupt Initiated I/O , DMA Controller, DMA Transfer, IOP-CPU-ICP Communication, Intel 8089 IOP

UNIT III:
Memory Organizations: Memory hierarchy, Main Memory, RAM,ROM Chips, Memory Address Map. Memory Connection to CPU, Associate Memory, Cache Memory, data Cache Instruction Cache, Miss & Hit Ratio, Access time, Associative, Set Associative, Mapping, Waiting into Cache Introduction to Virtual Memory

UNIT IV:
8086 CPU Pin Diagram Special functions of general purpose registers, Segment Registers, concept of pipelining, 8086 flag registers, Addressing Modes of 8086

UNIT V:
8086 Instruction formats: Assembly language programs involving branch and call instructions sorting, evaluation of arithmetic expressions.

TEXT BOOKS:
1. Computer Systems Architecture – M.Moris Mano, (UNIT-1,2,3)
2. Advanced micro Processors & peripherals Hall/AK Ray (unit-4,5)

REFERENCES BOOKS:
1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course outcomes
After this course students understand in a better way the I/O and memory organization in depth. They should be in a position to write assembly language programs for various applications

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(A1004) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

Introduction

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

Objectives:
This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

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

Syllabus:
The following course content is prescribed for the Advanced Communication Skills Lab:

1. **Functional English** –

- Starting a conversation
- responding appropriately and relevantly
- using the right body language
- roleplay in different situations.

2. **Vocabulary building**

- synonyms and antonyms,
- word roots,
- one-word substitutes,
- prefixes and suffixes,
- study of word origin,
- analogy,
- idioms and phrases verbs

3. **Group Discussion** –

- dynamics of group discussion,
- intervention,
- summarizing,
- modulation of voice,
- body language,
- relevance, f
- fluency and coherence.

4. **Interview Skills** –

- concept and process,
- pre-interview planning,
- opening strategies,
- answering strategies,
- Interview through tele and video-conferencing.

5. **Resume and Technical Report writing** –

- structure and presentation,
- planning,
- defining the career objective,
- projecting ones strengths and skill-sets,
- summary, formats and styles,
- Letter-writing.
- **Reading comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading.

LEARNING OUTCOMES

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

Minimum Requirement:

The English Language Lab shall have:

- The Computer aided Language Lab for 60 students with 60 systems,
- One master console, LAN facility and English language software for self- study by learners.
- The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.
- System Requirement (Hardware component):
- Computer network with Lan with minimum 60 multimedia systems with the following specifications:
  P – IV Processor
  d) Speed – 2.8 GHZ
  e) RAM – 512 MB Minimum
  f) Hard Disk – 80 GB
  Headphones of High quality

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

Suggested Software:

- Clarity Pronunciation Power – part II
- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL& GRE(KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)
- The following software from 'train2success.com'

  - ✓ Preparing for being Interviewed,
  - ✓ Positive Thinking,
  - ✓ Interviewing Skills,
  - ✓ Telephone Skills,
  - ✓ Time Management
  - ✓ Team Building,
  - ✓ Decision making

DISTRIBUTION AND WEIGHTAGE OF MARKS English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for **25** sessional marks and **50** year-end Examination marks. Of the **25** marks, **15** marks shall be awarded for day-to-day work and **10**

marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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B.Tech EEE VI-Sem **L T P C**
0 0 3 2

(A1228) POWER ELECTRONICS & SIMULATION LAB

Objective

This lab introduces the practical knowledge of power semiconductor devices, converters and choppers for different applications. The above converters also simulated in MATLAB and PSPICE and the waveforms will be compared.

Any Eight of the Experiments in Power Electronics Lab

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

Any two simulation experiments with PSPICE/PSIM

1. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
2. PSPICE simulation of resonant pulse commutation circuit and Buck chopper.
3. PSPICE simulation of single phase Inverter with PWM control.

REFERENCE BOOKS

1. Simulation of Electric and Electronic circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.
5. Spice for power electronics and electric power by Rashid, CRC Press

Course Outcomes

- Able to know the working of different converters like AC-AC, ACDC & DC-AC.
- Able to understand the characteristics of SCR, MOSFET & IGBT
- Able to understand practically the turn on and turn off methods of SCRs
- Capable to convert one particular frequency signal into different frequency signals.
- Able to simulate and code programs in PSPICE for different power electronic converters.

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B.Tech EEE VI-Sem **L T P C**
2 0 0 0

(A1012) ANALYTICAL SKILLS-II

Logical Reasoning
- Analogy
- Classification
- Series & Sequence
- Coding & Decoding
- Directions
- Blood Relations
- Seating Arrangements
- Clocks and Calendars

Analytical Ability & Reasoning
- Cubes
- Logical Deductions
- Figure Analysis
- General Puzzles
- Data Sufficiency
- Data Interpretation

Business English
- Basics of Communication Skills
- Articles
- Tenses
- S+ V agreement
- Model Verbs
- Be/do/has/have Forms
- Question Forms

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B.Tech EEE.VII-Sem **L T P C**
4 1 0 4

(A1229) UTILIZATION OF ELECTRICAL ENERGY

Objective
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.

UNIT – I: Electric Drives
Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – II: Electric heating & welding
Electric heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.
Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III: Illumination
Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.
Various illumination methods
Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – IV: Electric traction – I
System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking.
Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – V: Electric traction-II
Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

TEXT BOOKS
1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS
1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

Course Outcomes
- Able understand to the performance of different types of electrical drives, their characteristics and applications of the motors.
- Able to know the complete study of the electrical heating and welding
- Able to understand the basic fundamentals of illumination
- Able to understand the basic fundamental of electric traction.
- Able to understand the Calculations of tractive effort, power, specific energy consumption for given run.

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B.Tech EEE VII-Sem **L T P C**
4 0 0 4

(A1225) POWER SYSTEM OPERATION & CONTROL

Objective
This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modeling of turbines, generators and automatic controllers. It emphasize on single area and two area load frequency control and reactive power control.

UNIT – I: 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 – II: Hydrothermal Scheduling
Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems-Short term Hydrothermal scheduling problem.

UNIT –III: Modelling of Turbine, Generator and Controllers
Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.
Modelling of Generator (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model), Description of Swing Equation (No Derivation) and State-Space II-Order Mathematical Model of Synchronous Machine.
Modelling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function.
Modelling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT – IV: Single Area &Two-Area Load Frequency Control
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
Load Frequency Controllers
Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT – V: Reactive Power Control & Smart Grid
Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.(Qualitative Treatment)

Introduction to smart grids
Introduction to Smart Grid, Smart Grid architecture layers, Features of smart grid, Smart Grid Technology.

TEXT BOOKS
1. Electrical Power Systems by C.L.Wadhwa, Newage International-3rd Edition
2. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata M Graw – Hill Publishing Company Ltd, 2nd edition.

REFERENCE BOOKS
1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition.
2. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
3. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
4. Power System Analysis by Hadi Saadat – TMH Edition.

Course Outcomes
- Able to understand the economic operation of Power systems ,Reactive power control& basics of smart grids.
- Able to analyze the hydrothermal scheduling.
- To understand the modelling of turbine, generator, governor and excitation systems.
- Able to know the concepts of single area and two area load frequency controls.
- Able to study the operation of load frequency controllers

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B.Tech EEE VII-Sem **L T P C**
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(A1411) MICROPROCESSORS AND MICROCONTROLLERS

Course Objective
The Course Objectives are:
- To develop an in-depth understanding of the operation of Microprocessors and Microcontrollers, Machine language programming & Interfacing techniques.

UNIT- I: 8086Architecture
8086 Architecture-Functional diagram, Register organization, Memory segmentation, programming model, Memory addresses, physical memory organization, Architecture of 8086, signal descriptions of 8086-Common Function Signals, Timing diagrams, Interrupts of 8086.

UNIT- II: Instruction set and Assembly language programming of 8086
Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

UNIT- III: I/O Interface
8255 PPI, Various Modes of Operation and Interfacing to 8086, Interfacing keyboard, Display, D/A and A/D Converter.
Interfacing with advanced devices: Memory interfacing to 8086,Interrupt Structure of 8086,Vector interrupt table, Interrupt service routine.
Communication Interface: Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

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

UNIT – V: 8051 Real Time Control
Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

TEXT BOOKS
1. D.V. Hall, Micro Processors and Interfacing, TMGH, 2nd edition 2006.
2. Kenneth.J.Ayala,The 8051 Microcontroller, 3rd Ed, Cengage Learning.

REFERENCE BOOKS
1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2nd edition 2006.
2. The 8051 Microcontrollers, Architecture and programming and Applications- K.Uma Rao, AndhePallavi, Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.
4. Microcontrollers and Application, Aijay.V. Deshmukh, TMGH, 2005.
5. The 8085 Microprocessor: Architecture, Programming and interfacing- K. Uday Kumar, B.S.Umashankar, 2008, Pearson.

Course Outcome
- The Student will learn the internal organization of popular 8086/8085 Microprocessors/Microcontrollers.
- The Student will learn hardware and software interaction and integration.
- The student will learn the design of Microprocessors/Microcontrollers-based systems.

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(A1022) MANAGEMENT SCIENCE

Objectives

- Understand the concepts of management Administration and find & the difference between Organizing and organization and principles of Organization.
- Identifies the factors determining plant location and explain the concepts of plant layout, Marketing functions and the concepts of marketing and selling and channels of distribution.
- Understand the concept of job analysis, job description and job specification and the concepts of network, PERT and CPM& Understanding the direct cost and indirect cost.
- To identify the internal and external environmental factors and SWOT Analysis.
- The widely known concepts and practices prevalent in modern business and service Organization.

UNIT I: Introduction to Management &Organization

Introduction to Management : Concepts of Management and organization- nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT II: Operations& Marketing Management

Principles and types of plant layout-Methods of Production, Work study Basic procedure involved in method study and Work Measurement-Business process reengineering Statistical Quality Control: control charts for variables and Attributes and Acceptance sampling, Total Quality Management (TQM), Six sigma, Deming's contribution to quality, objectives of inventory control EOQ, ABC Analysis, Functions of marketing, marketing mix, marketing Strategies based on product life cycle, channels of distribution.

UNIT III: Human Resource Management

Human Resources Management (HRM) : Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRMvs.PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT IV: Project Management

Project Management (PERT/CPM) : Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

UNIT V: Strategic Management and Contemporary Strategic Issues

Strategic Management : Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balance Score Card as contemporary Business Strategies.

TEXT BOOKS

1. Aryasri: Management Science, McGraw Hill, 2012.
2. Vijay kumar and Apparao Management Science, Cenage, 2012.

REFERENCE BOOKS

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement,pearson,2012
2. Koontz &Weihrich: Essentials of Management, McGraw Hill,2012.
3. Thomas N.Duening& John M.Ivancevich Management—Principles and Guidelines, Biztantra,2012.
4. KanishkaBedi, Production and Operations Management, Oxford University Press, 2012
5. Schermerhorn, Capling, Poole &Wiesner: Management, Wiley, 2012.
6. Parnell: Strategic Management, Cengage2012.
7. Lawrence R Jauch, R.Gupta&William F.Glueck:Business Policy and Strategic Management, Frank Bros.2012.

Course Outcomes:

- Understanding the Organization environment and which kind of structure they have to follow to reach the Department goal after next Organization goal.
- Understanding before start the plant what are the factors they have to check and they know the production and to utilize the each and every raw materials.
- Knowing the recruitment of each and every employee, how they can show the performance appraisal and knowing the logical thinking to complete the work within the time period.
- Knowing the MISSION, VISION and OBJECTIVE Of corporate company and how to reach all those things and how to implement the strategy to reach the corporate goal.
- Knowing the just in time and how to maintain the quality and others

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(A1230) RENEWABLE ENERGY SOURCES

Objective
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.

UNIT – I: Solar Energy
Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.
Solar energy collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.
Storage and applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-II: Wind energy
Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-III: Bio-mass
Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-IV: Geothermal energy
Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V: Direct energy conversion
Need for DEC, Carnot cycle, limitations, principles of DEC.

TEXT BOOKS
1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS
1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

Course Outcomes
- Able to understand the concept of solar energy, instruments measuring for solar energy, Solar radiation data, Flat plate collectors and Concentrating collectors and advance collectors
- Able to understand the methods of Solar energy storage, solar ponds, solar applications, when to use horizontal and vertical axis wind mills and analyze Betz Criteria
- Able to understand the principles of Bio-conversion, bio-gas digesters, I.C engine operation, types of geothermal wells, methods of harnessing geothermal energy and Geothermal potential in India.
- Able to understand the principles and utilization of OTEC plants, tidal and wave energy, principle and operation of DEC, MHD Generators and Fuel cells

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(A1231) ELECTRICAL DISTRIBUTION SYSTEMS
(DEPARTMENTAL ELECTIVE-I)

Objective
This course gives the complete knowledge of electrical distribution systems, the design of feeders, substations. It also gives conceptual knowledge on how to determine the performance of distribution systems through the important parameters i.e. voltage drops and power losses and the very important thing that protection of the system by means of protective devices and their coordination during the several fault condition. It also specifies how to improve he voltage profiles and power factor of the system to better value using various voltage control and compensation techniques

UNIT – I: General concepts
Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor.
Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

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

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

UNIT –IV: Protection & coordination
Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers
Coordination of Protective Devices: General coordination procedure.

UNIT – V: Voltage Control & Power Factor Improvement
Voltage Control: Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.
Capacitive compensation for power-factor control:
Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched),
Power factor correction, capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

TEXT BOOKS
1. "Electric Power Distribution system, Engineering" – by Turan Gonen, Mc Graw-hill Book Company.
2. Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing company, 4th edition, 1997.

REFERENCE BOOKS
1. Electrical Power Distribution hand book by G.Ram murthy, 2ed,University press.
2. Electrical Power Distribution –by A.S.Pabla,Tata Mc. Graw-hill Publishing company,5th edition,1997

Course Outcomes
- Able to understand the types of distribution systems, Classification of loads and their characteristics
- Able to know the design considerations of substations and different types of distribution feeders
- Ability to calculate the voltage drops and power losses in three phase balanced primary lines.
- Able to understand the different types of faults and Protection of distribution system with coordination
- Able to know the different types of power factor Improvement methods and voltage control for distribution system

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(A1232) ADVANCED CONTROL SYSTEMS
(DEPARTMENTAL ELECTIVE-I)

Objective
This subject deals with state space, describing function, phase and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

UNIT-I: State space analysis
State Space Representation of electrical and mechanical systems, Solutions of State Equation, State Transition Matrix, Canonical Forms-Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.
Tests for controllability and observability for continuous time systems-Time varying case, minimum energy control, Time invariant case, Principle of Duality, Controllability and observability form Jordan canonical form and other canonical forms.

UNIT-II: Describing function analysis
Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems

UNIT-III: Phase-plane analysis
Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems

UNIT-IV: Stability analysis
Stability in the sense of Lyapunov., Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems**.**

UNIT-V: 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. Minimization of functional of single function, constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

TEXT BOOKS
1. Modern Control System Theory-by M.Gopal, New Age International Publishers, 2nd edition.1996
2. Modern Control Engineering-by K.Ogata, Prentice Hall of India, 3rd edition, 1998

REFERENCE BOOKS
1. Control Systems Engineering by I.J.Nagarath and M.Gopal, New Age International (P) Ltd.
2. Digital Control and State Variable Methods-by M.Gopal,Tata Mc Graw-Hill Companies,1997.
3. Systems and Control by Stainslaw H.Zak,Oxford Press,2003.
4. Modern control system-by Dorf, Pearson

Course Outcomes
- Able to realize any systems in state space model and solve them using state space analysis
- Able to know the basics of non linear systems and analyze them using describing function and phase plane analysis
- Capable of determining the stability and design the controllers for non linear systems
- Able to know the basic principles of optimal control theory and capable of formulating the optimal control problems
- Able to design the various feedback controllers and quadratic regulators to solve the optimal control problems

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(A1233) SOLAR PHOTO VOLTAIC SYSTEMS
(DEPARTMENTAL ELECTIVE-I)

Objective
The aim of this course is to make the student to have a detailed knowledge about Photovoltaic systems, it also deals with manufacture, sizing and operating techniques.

UNIT –I: Solar Energy
Sun and Earth, Solar spectrum, Solar Geometry, solar radiation on horizontal and inclined planes, Instruments for measurement of solar radiation, solar cell, equipment circuit, V-I characteristics, Performance improvement.

UNIT – II: Solar Cells
Manufacture of Solar cells-Techniques, Design of Solar cells, Photovoltaic modules, Design requirements, encapsulation systems, manufacture, power rating, hotspot effect, Design qualifications.

UNIT – III: Protection and Measurements
Flat plate arrays, support structures, module interconnection and cabling, lightning protection performance measurement- using natural sunlight and simulator, determination of temperature coefficients, internal series resistance, curve correction factor.

UNIT – IV: Photo Voltaic Systems
Photo voltaic systems –types-general design considerations-system sizing-battery sizing-inverter sizing-design examples-Balance of PV systems

UNIT – V: Maximum power point trackers
Maximum power point trackers –algorithms-perturb and observe- incremental conductance method, hill climbing method, hybrid and complex methods, data based and other approximate method, instrument design, other MPP techniques – Grid interactive PV system

TEXT BOOKS
1. Generating Electricity from Sun,F.C.Treble, Pergamon Press.
2. Photovoltaic systems: Analysis and Design, A.K.Mukherjee, Nivedita Thakur, PHI 2011
3. Solar Photovoltaic's: Fundamentals, Technologies and applications, C.S.Solanki, PHI, 2009

Course Outcomes
- Able to understand the concepts of Solar Energy and manufacturing techniques of solar cells.
- Able to know the protection and measurements of solar cells.
- Acquire the knowledge of photo voltaic systems.
- Able to understand different methods for maximum power point trackers

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(A1417) MICROPROCESSORS & MICROCONTROLLERS LAB

Note: Minimum of 12 experiments is to be conducted.

List of Experiment:

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

List of Experiments:

1. Program for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086
7. Parallel communication between two microprocessors using 8255
8. Serial communication between two microprocessors using 8251
9. Interfacing to 8086 and Programming to control stepper motor.
10. Program using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART Operation in 8051
14. Communication between8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing matrix/keyboard to 8051.
17. Data transfer from Peripheral to memory through DMA controller 8237/8257.

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(A1234) ELECTRICAL MEASUREMENTS LAB

Objective

This lab introduces the different calibration techniques of different meters and three phase reactive power measurement. It also aims at measurement of different parameters using bridges, potentiometers and transducers

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

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil Testing.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 phases reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods

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

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

Course Outcomes

- Able to calibrate single phase energy meter, dynamometer power factor meter and Crompton's D.C Potentiometer.
- Able to measure resistance, inductance and capacitance using suitable bridges practically.
- Able to measure 3 phase reactive power and choke coil parameters using different methods practically.
- Able to calibrate and draw the characteristics of LVDT and Resistance strain gauge.
- Able to find the dielectric strength and breakdown voltage of transformer oil.

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(A1236) FUNDAMENTALS OF HVDC & FACTS

Objective
This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters. It also deals with Reactive power control and Power factor improvements of the system.

UNIT – I: Basic concepts
Comparison of AC &DC Transmission, Application of DC Transmission .Typical layout of a HVDC converter station. Choice of Converter configuration – analysis of Graetz circuit – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance.

UNIT – II*:* Converter & HVDC system control
Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link.

UNIT-III: Harmonics, filters and Reactive Power Control
Introduction, Generation of Harmonics AC & DC Filters.Reactive Power Requirements in steady state-Sources of reactive power, static VAR systems
Power flow analysis in AC/DC systems
Modelling of DC/AC converters- Controller Equations-Solution ofAC/ DC load flow-Simultaneous method-Sequential method.

UNIT-IV: Introduction to FACTS
Power flow in an AC system, basic types of FACTS controllers brief description and definitions of FACTS controllers.
Static Shunt Compensators: Objectives of shunt compensation, methods of controllable VAR generation static VAR compensators, SVC and STATCOM, comparision between SVC and STATCOM

UNIT – V: Static Series Compensators
Objectives of series compensation, Variable impedance type – thysistor
switched series capacitors (TCSC) and switching converter type series compensators, static series synchronous compensator (SSSC) - power angle characteristics- basic operating control schemes**.**
Combined Compensotors: Introduction to Unified power flow controller(UPFC), basic operating principle, independent real and reactive power flow controller, control structure.

TEXT BOOKS
1. HVDC Transmission S.Kamakshaiah, V.Kamaraju, The Mc- Graw Hill Companies
2. "Understanding FACTS Devices" N.G. Hingorani and L. Guygi. IEEE Press Publications 2000.

REFERENCE BOOKS
1. HVDC and FACTS Controllers Applications of Static Converters in Power Systems, Vijay K.Sood, Kluwer academic Publishers.
2. HVDC Power Transmission Systems K.R.Padiyar, New Age International (P) Limited, and Publishers
3. HVDC Transmission – J.Arrillaga.
4. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons
5. Thyristor – Based Controllers for Electrical Transmission systems,R.Mohan Mathur, rajiv K.Varma,Wiely India
6. FACTS Modeling and Simulation in power networks,Enrique Acha Wiley India Distributed by BSP Books Pvt.Ltd

Course Outcomes
- Able to understand the different types of DC links, HVDC Transmission advantages and its applications
- Capable to analyze the converter characteristics for different pluses
- Able to design the filters for different harmonics in HVDC system and able to understand the power flow in AC /DC systems, converter and reactive power control characteristics in HVDC systems
- Able to know different types of FACTS controllers and objectives of shunt compensation.
- Able to know the objectives of series compensation different types of series compensators and combines compensators

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(A1237) HIGH VOLTAGE ENGINEERING
(DEPARTMENTAL ELECTIVE-II)

Objective
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.

UNIT- I: Introduction to high voltage technology and applications
Electric Field Stresses, Gas / Vaccum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT- II: Break down in dielectric materials
Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.
Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT- III: Generation measurement of high voltages 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- IV: 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 -V: Non-destructive testing of material and electrical apparatus
Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.
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 – TMH Publications, 3rd Edition
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

REFERENCE BOOKS
1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.

Course Outcomes

- Able to understand the importance of high voltage technology and its applications
- Able to understand the breaking phenomena and dielectric strength of different mediums (solids, gaseous, liquids)
- Able to understand how to generate and measure high voltages and currents
- Capable to understand different causes of over voltages and insulation coordination for over voltages
- Able to understand different types of testing methodologies of various high voltage apparatus

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(A1238) NANOTECHNOLOGY
(DEPARTMENTAL ELECTIVE-II)

Objective

Nano -Technology is one of the core subjects of multidisciplinary nature. This has extensive applications in the field of energy, electronics, Biomedical Engineering.Etc. Built to specifications by manufacturing matter on the atomic scale, the Nano products would exhibit an order of magnitude improvement in strength, toughness and efficiency. The objective here is imparting the basic knowledge in Nano Science and Technology.

UNIT-I: Introduction

History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

UNIT-II: Unique Properties of Nanomaterials: Microstructure and Defects in Nano- crystalline Materials
Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and disclinations,

Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics ,Enhanced solid solubility,

Magnetic Properties: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance , Electrical Properties ,Optical Properties ,Thermal Properties and Mechanical Properties.

UNIT-III: Synthesis Routes: Bottom up approaches

Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self assembly,Top down approaches**:** Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

UNIT-IV: Tools to Characterize Nano materials

X- Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy(AFM),Scanning Tunneling Microscope(STM),Field lon Microscope (FEM), Three – dimensional Atom Probe (3DAP), Nanoindentation

UNIT-V: Applications of Nano material

Nano –electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry , Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water-Treatment and the environment, Nano- medical applications, Textiles, Paints, Energy , Defence and Space Applications , Concerns and challenges of Nanotechnology.

TEXT BOOKS

1. Text Book of Nano Science and Nano Technology, B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday,University Press-IIM.
2. Introduction to Nanotechnology, Charles P.Poole, Jr., and Frank J.Owens, Wley India.

REFERENCES BOOKS

1. Nano: The Essentials, T.Pradeeep, Mc Graw –Hill Education.
2. Nanomaterials, Nanotechnologies and Design, Michael F.Ashby, Paulo J.Ferreira and Daniel L.Schodek.
3. Transport in Nano structures, David Ferry, Cambridge University press.
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact, Ed.Challa S.S.R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications, Michael J .O'Connell.
6. Electron Transport in Mesoscopic systems, S. Dutta, Cambridge University press.

Course Outcomes

- Able to know the classification, applications and different properties of Nano materials.
- Able to understand synthesis process.

- Able to know the tools to characterize nano materials and applications of nano materials.

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(A1239) DIGITAL CONTROL SYSTEMS
(DEPARTMENTAL ELECTIVE-II)

Objective
This course gives fundamentals of digital control systems, Z-Transforms, state space representation of the control systems, concepts of controllability and observability, estimation of stability in different domains, design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

UNIT – I: Sampling and reconstruction and Z – transforms
Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations. Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms. Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

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

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

UNIT –IV: Design of discrete time control system by conventional methods
Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

UNIT – V: State feedback controllers and observers
Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS
1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition

REFERENCE BOOKS
1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.
2. Digital Control and State Variable Methods by M.Gopal, TMH

Course Outcomes
- Able to know the basic concepts of digital signals and Z - Transforms
- Able to know the similarities and differences between the Z-Plane and S-Plane analysis
- Capable of realizing the systems in discrete time state space model, and ability to estimate the controllability and observability of discrete time systems
- Able to determine the stability and design the controllers for any discrete systems using time and frequency domain analysis
- Able to design the various feedback controllers and observers for effective function of discrete time systems

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(A1204) EXTRA HIGH VOLTAGE AC TRANSMISSION
(DEPARTMENTAL ELECTIVE-III)

Objective

The objective of this course is to introduce the concepts of extra high voltage AC transmission emphasize on the behaviour of the line parameters for extra high voltages, voltage gradients of the transmission line conductor's gradients, effect of corona, electrostatic field calculations, travelling wave theory concept, voltage control when line carries extra high voltages.

UNIT-I: Preliminaries and ground reactive parameters
Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses- mechanical considerations – resistance of conductors – properties of bundled conductors – bundle spacing and bundle radius-Examples. Line inductance and capacitances – sequence inductances and capacitances – modes of propagation – ground return – Examples

UNIT-II: Voltage gradients of conductors
Electrostatics – field of sphere gap – field of line changes and properties – charge – potential relations for multi-conductors – surface voltage gradient on conductors – distribution of voltage gradient on sub-conductors of bundle – Examples.

UNIT-III: Corona effects
Power loss and audible noise (AN) – corona loss formulae – charge voltage diagram – generation, characteristics - limits and measurements of AN – relation between 1-phase and 3-phase AN levels – Examples. Radio interference (RI) - corona pulses generation, properties, limits – frequency spectrum – modes of propagation – excitation function – measurement of RI, RIV and excitation functions – Examples.

UNIT-IV: Electro static field and Travelling wave theory
Electrostatic field: calculation of electrostatic field of EHV/AC lines – effect on humans, animals and plants – electrostatic induction in unexercised circuit of double-circuit line – electromagnetic interference-Examples.Traveling wave expression and solution- source of excitation- terminal conditions- open circuited and short-circuited end-reflection and refraction coefficients-Lumped parameters of distributed lines-generalized constants-No load voltage conditions and charging current.

UNIT-V: Voltage control
Power circle diagram and its use – voltage control using synchronous condensers – cascade connection of shunt and series compensation – sub synchronous resonance in series capacitor – compensated lines – static VAR compensating system.

TEXT BOOKS
1. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (p) Ltd.
2. HVAC and DC Transmission by S. Rao

Course Outcomes
- General aspects and necessity of extra high voltage (EHVAC) transmission advantages and disadvantages of EHVAC.
- Concepts of voltage gradient effects of corona.
- Ability to perform calculations on electrostatic fields and travelling waves.
- Voltage control of EHVAC transmission which will able them to apply to real world problems.

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(A1205) LINEAR SYSTEMS ANALYSIS
(DEPARTMENTAL ELECTIVE-III)

Objective
This course deals with significance of state space analysis, role of Fourier transforms and Laplace transforms in linear systems, testing of polynomials, realization of different networks and sampling phenomena.

UNIT-I: State variable analysis
Choice of state variables in Electrical networks-Formulation of state equations for Electrical networks-Equivalent source method. Network topological method - Solution of state equations-Analysis of simple networks with state variable approach.

UNIT–II: Fourier series and Fourier transform representation
Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function, Properties of Fourier Transform ,Parseval's theorem , Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.
Applications of Fourier series and Fourier transform representation
Introduction, Effective value and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier series.

UNIT – III: Wavelet transforms:
Definition of a wavelet -General formulae-Examples: continuous wavelet-transforms and interpretation, Mexican hat wavelet, Morlet wavelet -Comparison and interpretation- Orthogonal wavelet transform, Discrete wavelets, Orthogonal wavelets, Fast wavelet transform, Examples of orthogonal wavelets

UNIT-IV: Testing of polynomials & network synthesis
Elements of realizability-Hurwitz polynomials-positive real functions-Properties-Testing-Sturm's Test, examples.

Network synthesis: Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Cauer methods

UNIT-V: Sampling
Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

TEXT BOOKS

1. Networks and systems-D Roy Chowdhary, New Age International
2. Network Analysis and Synthesis – Umesh Sinha- Satya Prakashan Publications

REFERENCE BOOKS
1. Linear System Analysis – A N Tripathi, New Age International
2. Network and Systems – D Roy Chowdhary, New Age International
3. Engineering Network Analysis and Filter Design- Gopal G Bhisk & Umesh
4. Linear system analysis by A.Cheng, Oxford publishers.

Course Outcomes
- Able to understand the concept of state, state variables and to do the analysis of electrical networks using state equations
- Able to understand the concept of state, state variables and to do the analysis of electrical networks using state equations
- Able to understand the concept of realizability and to do the synthesis of LC, RL and RC networks by Foster and Cauer methods.
- Able to understand the concept of discrete time systems, sampling, energy and power density spectrums and Z - Transforms

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(A1207) RELIABILITY ENGINEERING
(DEPARTMENTAL ELECTIVE-III)

Objective
This subject introduces the concept of probability, reliability, distribution functions and various methods and techniques to calculate and estimate the reliability of different engineering problems and models.

UNIT – I: Basics of Probability theory & Distribution
Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probabilities density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

UNIT – II: Network Modelling and Reliability Analysis
Analysis of Series, Parallel, Series-Parallel networks – complex networks – decomposition method.

UNIT – III: Reliability functions
Reliability functions f(t), F(t),R(t),h(t) and their relationships – exponential distribution – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution – reliability measures MTTF, MTTR, MTBF.

UNIT – IV: Markov Modelling
Markov chains – concept of stochastic transitional probability Matrix, Evaluation of limiting state Probabilities. – Markov processes one component repairable system – time dependent probability evaluation using Laplace transform approach – evaluation of limiting state probabilities using STPM – two component repairable models.

UNIT – V: Frequency & Duration Techniques
Frequency and duration concept – Evaluation of frequency of encountering state, mean cycle time, for one , two component repairable models – evaluation of cumulative probability and cumulative frequency of encountering of merged states.

TEXT BOOKS
1. Reliability Evaluation of Engg. System – R. Billinton, R.N.Allan, Plenum Press, New York, reprinted in India by B.S.Publications, 2007.
2. Reliability Evaluation of Power systems – R. Billinton, R.N.Allan, Pitman Advance Publishing Program, New York, reprinted in India by B.S.Publications, 2007.

Course Outcomes
- Able to apply the probability theory and binomial distribution to power system networks
- Able to analyze the networks which are in parallel and series
- Able to understand reliability analysis of various models through different methods reliability functions, repairable irreparable systems through markov modeling frequency and duration techniques.