R.V.R. & J. C. COLLEGE OF ENGINEERING

(AUTONOMOUS)

CHOWDAVARAM, GUNTUR - 522 019

Regulations (R-12),

Scheme of Instruction, Examinations and Syllabi

For Four Year B.Tech. Degree Programme

[w.e.f. 2012-13]

ELECTRICAL & ELECTRONICS ENGINEERING

R.V.R. & J. C. COLLEGE OF ENGINEERING

(Autonomous)

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Regulations (R-12), Scheme of Instruction, Examinations and Syllabi

[Four Year B.Tech. Degree, w.e.f. 2012-13]

ELECTRICAL AND ELECTRONICS ENGINEERING

THE INSTITUTION

Established in 1985, Rayapati Venkata Ranga Rao & Jagarlamudi Chandramouli College of Engineering, Guntur is the 'Jewel in the Crown' of Nagarjuna Education Society, which took upon itself the responsibility of enriching the society through promotion of education, literature and culture. As it always happens, the genuine intentions of the promoters of the society received the support of the Almighty. Today eight educational institutions are functioning under the banner and patronage of Nagarjuna Education Society, with R.V.R. & J.C. College of Engineering, being the flag-ship of them, of course.

The Mission

An integrated development of manpower possessing technological and managerial knowledge and skills, values and ethics needed to make an honourable living and contribute to the socio-economic development and welfare of the society.

The Genesis and Growth

Like all great institutions, the College too had a humble beginning with just 180 intake and a barely adequate infrastructure in1985, it is the determination and commitment of the Management that made the College one of the largest among Engineering Institutions in South India with excellent infrastructure, facilities and competent human resources. Today, it offers eight B.Tech., Degree Courses with an intake of 1020 plus 204 through lateral entry into the II Year for Diploma Holders, Further, the College offers MBA, MCA and M.Tech. in five specializations.

In 1998 it has become the youngest College to have been accredited and as on date all the seven eligible B.Tech. Degree Courses have been accredited in 2002,2007 and again in 2012. It has became the first Engineering College in the state to have been accredited fourth time by N.B.A., New Delhi. Further in the Academic Audit and Grading done by Andhra Pradesh State Council of Higher Education, Govt. of A.P., the institute is rated as the SECOND best among Private Engineering Colleges of A.P. and FOURTH best amongst all Engineering Colleges of A.P. including University Engineering Colleges. It has also figured among the "Top-100" Engg. Colleges in independent surveys conducted in 2006 & 2007 by the popular magazine the 'OUTLOOK'. The College received

first prize for Best Performing Professional UG College in University Examination Results for the last FIVE consecutive years. The College is a typical example of meticulous planning, resource scheduling, human endeavour and institutional management.

COURSES OFFERED

1) Under-Graduate: B.Tech.

i)	Civil Engineering (1985)	120
ii)	Mechanical Engineering (1985)	180
iii)	Electronics & Communication Engg. (1985)	180
iv)	Electrical & Electronics Engg. (1994)	120
v)	Computer Science & Engineering (1994)	180
vi)	Chemical Engineering (1996)	60
vii)	Information Technology (1998)	120
viii)	Bio-technology (2006)	60

2) Post-Graduate:

i)	Management Sciences (MBA) (1995)	120
ii)	Computer Applications (MCA) (1995)	120
iii)	M.Tech in CSE (2003)	25
iv)	M.Tech in Power Systems Engineering (2004)	18
v)	M.Tech. Structural Engineering (2004)	18
vi)	M.Tech. CAD/CAM (2004)	18
vii)	M.Tech. Communication Engineering And Signal Processing(2011)	18

The Campus

A built up area of 59,077 sq.m. on a 37.41 acres plot houses, 61 Laboratories and 18 Computer Centres besides amenities like Canteen, Seminar Halls, Auditorium, Open Air Theatre, Gymnasium, e-classrooms and Conference Halls etc. to make life in the classroom and outside easy and comfortable. Continuous power supply provided from 200 KVA, 250 KVA and 500 KVA modern Generator sets. Andhra Bank Branch located in the campus. A fleet of 24 buses, save the staff and students from the vagaries of public transport.

The aesthetically designed structures, the hill slopes on the West, a well laid out campus dotted with roads, trees and gardens merge into a stunning landscape that inspires the minds to "Think Better, Work Better".

The Work Culture

The Management and Staff are a group of uncompromising people who stretch beyond reasonable limits to attain their objective - Excellence in everything they do. The people of RVR & JC have learnt that meeting of the minds and joining hands is the easier way to success. They do meet and interact frequently to set new starting lines than to celebrate the finishing lines reached.

The People

The College is possessive of its intellectual property; a 257-strong faculty with diversity in specialization and heterogeneity in abilities, have unity in their objective of enriching the students with up-to-date technical information, data and skills. The teachers adopt a very professional attitude and commitment in imparting instruction, counseling and personality development in which the student has the final say. The emphasis is more on learning of the student than on teaching. All our teachers are rated 90% good by the students.

The 165-odd administrative and supporting people provide the logistics to run academic and administrative operations, with silent efficiency.

Discipline

Insulating the students from the vulnerable influence due to the society's contemporary aberrations is our endeavor. The institution had become the choice of the parents for its track-record of campus discipline. The ambience and the exemplary orderliness of behavior of the staff induces a self-imposed discipline in the students. The temporary abnormalities if any, are disciplined, of course.

Computer Centres

The computer facilities are vast. About 1500 terminals with latest configuration are located in fourteen Central and Department Computer Centres, all air conditioned. Software necessary for effective training and instruction as well as for consultancy are in place. All the computers in the campus have been interconnected through campus-wide intranet using Fibre Optic cables and switches. The City Computer Centre is an off-time facility for students & staff. Examination & administrative services are Computerised. Currently, 16 MBPS Wireless Internet connectivity is provided by installing a Micro Tower.

Library

The four-storied library of 87,468 volumes of 25,910 titles, 3,267 CDs and educational films is the biggest learning resource in the campus. 257 National and International Journals provide up-to-date information on any topic the students and staff look for. Orderly stacking, computerized information and the seven qualified library staff facilitate easy location of any information needed. The Digital Library is providing internet facility to all the students with 17 systems. Comfortable seating arrangement and large reading spaces provide a serene atmosphere for spending long hours in the library. The City Centre too has a reference library that is open upto 10.00 p.m.

Hostels

Four storeyed Girls hostel with a 6,040 sq.m. accommodating 400 girl students with modern facilities available. Newly constructed four storied boys hostel with a 11,152 sq.m. accommodating 500 students with modern facilities in the College campus.

The Students

From the day of induction, the staff do everything to naturalize the students to the culture of R.V.R. & J.C. College of Engineering i.e. single minded pursuit of the objective. The part played by the students in making the College, into an ideal seat of learning is significant. The students of this College consistently produce the best of the results in the University.

Extra-curricular Activities

NCC, NSS Units established in the College. Opportunities are a plenty for those with extracurricular talent. Numerous competitions are held for various levels of students, who have proved their superiority in various inter-collegiate competitions conducted by public organizations and other institutions. The students prove their leadership qualities and co-operative skills by organizing colorful functions at regular intervals.

Campus Recruitment

About 50 renowned industries / IT Organizations regularly visit the College to recruit the final years for employment. A training and placement Department monitors recruitment, short term training and personality development programmes. During the last four years the Campus recruitment steadily grew up.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

The Department of Electrical and Electronics Engineering was established during the academic year 1994 - 1995 with an intake of 60 students. The intake has been enhanced to 120 students from the academic year 2004 -2005. The Program was accredited and awarded 'A' Grade for Five years by National Board of Accreditation of AICTE in the year 2002, reaccredited in 2007 and 2012 .

The EEE department was permitted to start M.Tech course in Power Systems Engineering by AICTE, New Delhi, from the academic year 2004-2005 with an intake of 18 students.

EEE department is supported by 30 experienced & dedicated Faculty and 11 Non - Teaching staff. Faculty of EEE department are specialized in the core areas of Electrical & Electronics Engineering like Power Systems, Power Electronics, Electrical Machines & Industrial Drives, High voltage Engineering etc. Electrical installations of all laboratories and buildings are maintained by the department staff as an essential service since the inception of the college.

The department has the following laboratories with latest equipment as per AICTE norms.

1. Basic Electrical Engineering Lab
2. Advanced Electrical Machines Lab
3. Electrical Measurements Lab
4. Control Systems Lab
5. Microprocessors & Microcontrollers Lab
6. Power Electronics Lab
7. Computer Applications Lab
8. Power Systems Lab
9. Basic Electronics Lab
10. Electrical Workshop Practice Lab

The Mission of the Department is "The Integrated development of professionals with knowledge and skills in the fields of specialization and ethics and values needed for employability in the fields of Electrical Engineering and contribute to the economic growth of the employing organization and pursue lifelong learning"

In tune with the mission of the Department, Program Objectives and Program Outcomes are aimed. Program Educational Objectives describe the expected accomplishments of graduates during the first few years after graduation. Program Outcomes are statements that describe what students are expected to know and be able to perform by the time of graduation. These relate to skills, knowledge and behaviors the student acquire during their course of study.

PROGRAM EDUCATIONAL OBJECTIVES:

I. To provide to the students with a strong foundation in Mathematics, Basic & Engineering Sciences and core area Knowledge through rigorous education to enable him to pursue higher education / take up employment in India/ Aboard.
II. To provide students with a solid foundation in Electrical & Electronics Engineering and allied subjects to enable him to solve technological problems related to Electrical & Electronics Engineering.
III. To provide students with an ability to integrate knowledge of various courses to design newer products, innovate existing systems in the broader interests of the organization & society.
IV. To inculcate in the student communication and inter personal skills, team work and managerial skills necessary to be effective in multidisciplinary system.
V. To provide the students with an academic environment in which the ethical codes of life & profession, leadership and excellence flourish lifelong learning and successful professional career.

PROGRAM OUTCOMES:

The graduate will demonstrate/ exhibit

a. An ability to apply knowledge of Applied Mathematics, Basic Engineering sciences.
b. An ability to identify, formulate and solve Electrical Engineering problems.
c. An ability to analyze and interpret data while designing components and systems to meet the needs of industry within realistic constraints.
d. Knowledge of contemporary issues.
e. An ability to work and visualize effectively in laboratories, industries among multidisciplinary teams.
f. Skill to use modern engineering tools, software and equipment in modern Electrical Engineering practice.

g. An understanding of managerial, professional and ethical responsibility.
h. An ability to communicate effectively in both verbal and written form.
i. The understanding the impact of engineering solutions in global, economic, environmental, safety and societal context.
j. Recognition of the need and ability to engage in lifelong learning
k. An ability to carry out interdisciplinary programs and research in National/International organizations.

The department has its own Library in addition to main Library. The department has obtained permission from Government of Andhra Pradesh to carry out consultancy Work to the Industries/Organizations in and around Guntur.

Faculty members of the Department are dedicated and have the vision to work for the welfare and prospect of the students. Slow learners are identified and suggestions & guidance is given by Faculty of the Department to improve their ability and overall performance apart from career guidance. The Department is proud to state that the Academic results are always above 95%. It is regular practice to the Department students to won top University ranks consistently in Electrical & Electronics Engineering since its inception.

Faculty motivates the students to take part in National level Quiz competitions, Workshops, Seminars, Group discussions, Design contests, Paper presentation contests and Poster presentations. Students are also encouraged to take part in NCC, NSS, Sports and various Cultural activities. The Department students are taken to short and long Industrial study tours to provide Industrial exposure.

The department in association with IEEE student branch, ISTE chapter and EEE students Association (RAJEEA) organizes activities like quiz, workshops, seminars, Group discussion, paper contests and poster presentations etc. Every student of Electrical & Electronics Engineering will become a member of RVR&JC Electrical & Electronics Engineering Association (RAJEEA).

The students are trained and coaching is given to appear GRE, TOEFL, IES, GATE and Public sector examinations. Special emphasis is given on improvement of Professional skills, Communication skills and Entrepreneur skills. Campus interviews are arranged through placement cell of RVR & JC College of Engineering. The Alumni of EEE Department spread throughout the world and serving to the needs of the society.

R.V.R. & J.C. COLLEGE OF ENGINEERING::GUNTUR (AUTONOMOUS)

REGULATIONS (R-12) FOR

FOUR - YEAR B.TECH. DEGREE COURSE

(with effective from the batch of students admitted into first year B.Tech. from the academic year 2012-2013).

1.0. MINIMUM QUALIFICATIONS FOR ADMISSION

A candidate seeking admission into First Year of B.Tech. Degree Course should have passed either Intermediate examination conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics, and Chemistry as optional subjects (or any equivalent examination recognized by the Acharya Nagarjuna University) or Diploma in Engineering in the relevant branch conducted by the State Board of Technical Education & Training of Andhra Pradesh (or equivalent Diploma recognized by Acharya Nagarjuna University).

The selection is based on the rank secured by the candidate at the EAMCET / ECET (FDH) examination conducted by A.P. State Council of Higher Education. The candidate shall also satisfy any other eligibility requirements stipulated by the University and / or the Government of Andhra Pradesh from time to time.

2.0. BRANCHES OF STUDY

2.1. The B.Tech. Course is offered in the following branches of study:

1 Biotechnology
2 Chemical Engineering
3 Civil Engineering
4 Computer Science & Engineering
5 Electrical & Electronics Engineering
6 Electronics & Communication Engineering
7 Information Technology
8 Mechanical Engineering

2.2 In addition to the core electives, an open elective (non-departmental elective) is to be offered in the first semester of fourth year by all branches of B.Tech. courses.

3.0. DURATION OF THE COURSE AND MEDIUM OF INSTRUCTION

3.1 The duration of the course is four academic years consisting of two semesters in each academic year. The medium of instruction and examination is English.

3.2 The duration of the course for the students (Diploma Holders) admitted under lateral entry into II/IV B.Tech. is three academic years consisting of two semesters in each academic year. The medium of instruction and the Examination is English.

4.0. MINIMUM INSTRUCTION DAYS

Each semester shall consist of a minimum number of 90 days of instruction excluding the days allotted for tests, examinations and preparation holidays.

5.0 EVALUATION

The performance of the students in each semester shall be evaluated subject wise

5.1. The distribution of marks between sessionals (based on internal assessment) and Semester end Examination is as follows:

Nature of the subject	Sessional Marks	End Semester Exam. Marks
Theory subjects/Design and/ or Drawing/Practicals	40	60
Mini Project / Term Paper	100	----
Project work	80	120 (Viva voce)

5.2. In each of the Semesters, there shall be two Mid Term examinations and two Assignment Tests in every theory subject. The Sessional marks for the midterm examinations shall be awarded giving a weightage of 15 marks out of 18 marks (80% approx.) to that midterm examination in which the student scores more marks and the remaining 3 marks (20% approx.) for other midterm examination in which the student scores less marks. Similarly a weightage of 10 marks (80% approx.) out of 12 marks earmarked for assignment tests shall be given for the assignment in which the student scores more marks and remaining 2 marks (20%

approx.) shall be given for the assignment test in which the student scores less marks.

Five marks are allotted for attendance in the respective theory subjects in a graded manner as indicated in ***clause 7.2.*** The remaining 5 marks out of the 40 marks earmarked for the internal sessional marks are awarded (quiz/online examination) by the concerned teacher in the respective theory subjects.

5.3. The evaluation for Laboratory class work consists of a weightage of 25 marks for day to day laboratory work including record work and 15 marks for internal laboratory examination including Viva-voce examination.

In case of Project work, the sessional marks shall be awarded based on the weekly progress, the performance in two Seminars and the Project Report submitted at the end of the semester. The allotment of sessional marks for Seminars and day-to-day class work shall be 30 and 50 respectively.

NOTE : A student who is absent for any Assignment / Mid Term Exam, for any reason whatsoever, shall be deemed to have scored zero marks in that Test / Exam and no make-up test / Exam shall be conducted.

5.4. A student who could not secure a minimum of 50% aggregate sessional marks is not eligible to appear for the semester-end examination and shall have to repeat that semester.

6.0. **LABORATORY / PRACTICAL CLASSES**

In any semester, a minimum of 90 percent experiments / exercises specified in the syllabus for laboratory course shall be completed by the student and get the record certified by the concerned Head of the Department, to be eligible to face the Semester end Examination in that Practical subject.

7.0. **ATTENDANCE REGULATIONS**

7.1 Regular course of study means a minimum average attendance of 75% in all the subjects computed by totalling the number of hours / periods of lectures, design and / or drawing, practical's and project work as the case may be, held in every subject as the

denominator and the total number of hours / periods actually attended by the student in all the subjects, as the numerator.

7.2 A weightage in sessional marks up to a maximum of 5 marks out of 40 marks in each theory subject shall be given for those students who put in a minimum of 75% attendance in the respective theory in a graded manner as indicated below:

Attendance of 75% and above but less than 80%	-	1 mark
Attendance of 80% and above but less than 85%	-	2 marks
Attendance of 85% and above but less than 90%	-	4 marks
Attendance of 90% and above	-	5 marks

7.3 Condonation of shortage in attendance may be recommended on genuine medical grounds, up to a maximum of 10% provided the student puts in at least 65% attendance as calculated in ***Clause 7.1*** above, provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

7.4 A student who could not satisfy the minimum attendance requirements as given above, in any semester, is not eligible to appear for the semester end examinations and shall have to repeat that semester.

8.0 **DETENTION**

A student, who fails to satisfy either the minimum attendance requirements as stipulated in ***Clause 7,*** or the requirement of minimum aggregate sessional marks as stipulated in ***Clause 5***, shall be detained. Such a student shall have to repeat the same semester subsequently and satisfy the above requirements afresh to become eligible to appear for the semester-end examination.

9.0. **SEMESTER END EXAMINATION**

9.1. For each theory subject, there shall be a comprehensive semester end Examination of three hours duration at the end of each Semester, unless stated otherwise in the detailed Scheme of Instruction.

Question paper setting shall be entrusted to external examiners from the panels approved by the respective Boards of Studies.

9.2. For each Practical subject, the semester end examination shall be conducted by one internal and one external examiner appointed by the Principal of the College, the duration being that approved in the detailed Schemes of Instruction & Examination.

9.3 Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner appointed by the Principal.

10.0 **CONDITIONS FOR PASS**

A candidate shall be declared to have passed the Semester end Examination in individual subjects if he / she secures a minimum of 35% marks in theory and 50% marks in Practical subjects and drawing subjects (including Project Viva-voce).

11.0 **AWARD OF CREDITS**

Credits are awarded for each Theory/Practical Subjects. Each theory subject is awarded four credits and each practical subject is awarded two credits. Project work is awarded ten credits. However for some specific subjects more/less than four credits may be awarded by individual boards. The total number of credits for all the four years put together should be in the range of 218-224 for any branch.

11.1 AWARD OF GRADES

S.No.	Range of Marks	Grade	Grade Points
1	≥85%	S	10.0
2	75%-84%	A	9.0
3	65%-74%	B	8.0
4	55%-64%	C	7.0
5	45%-54%	D	6.0
6	40%-44%	E	5.0
7	≤39%	F (Fail)	0.0
8	The grade "W" represents withdrawal/absent (subsequently changed into pass or E to S or F grade in the same semester)	W	0.0

11.2 A Student securing 'F' grade in any subject there by securing zero grade points has to reappear and secure at least 'E' grade in the subsequent examinations for that subject.

11.3 After each semester, Grade sheet will be issued which will contain the following details:

- The list of subjects for each semester and corresponding credits and Grades obtained
- The Grade Point Average(GPA) for each semester and
- The Cumulative Grade Point Average(CGPA) of all subjects put together up to that semester from first semester onwards

GPA is calculated based on the following formula:

$$\frac{\sum[No.of\ Credits\ X\ Grade\ Points]}{\sum of\ Credits}$$

CGPA will be calculated in a similar manner, considering all the subjects enrolled from first semester onwards.

12.0 **CONDITIONS FOR PROMOTION**

12.1 A student shall be eligible for promotion to II/IV B.Tech. Course if he / she satisfies the minimum requirements of attendance and sessional marks as stipulated in ***Clauses 5 and 7***, irrespective of the number of backlog subjects in I/IV B.Tech.

12.2 A student shall be eligible for promotion to III/IV B.Tech. Course if he / she secures a minimum of 70% of the total number of credits from two regular and one supplementary examinations of first semester and one regular and one supplementary examinations of second semester of I/IV B.Tech.(including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in II/IV B.Tech.

12.3 A student shall be eligible for promotion to IV/IV B.Tech. course if he/she secures a minimum of 70% of the total number of credits from three regular and two supplementary examinations of first semester and two regular and two supplementary examinations of second semester of I/IV B.Tech. and two regular and one supplementary examinations of II/IV B.Tech. first semester and

one regular and one supplementary examinations of II/IV B.Tech. second semester (including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in III/IV B.Tech.

12.4 A student (Diploma Holder) admitted under lateral entry into II/IV B.Tech. shall be eligible for promotion to IV/IV B.Tech. course if he/she secures a minimum of 70% of the total number of credits from two regular & one supplementary examinations of II/IV B.Tech. first semester and one regular and one supplementary examinations of II/IV B.Tech. second semester (including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in III/IV B.Tech.

13.0 **ELIGIBILITY FOR AWARD OF B.TECH. DEGREE**

The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements:

13.1 The candidate must have satisfied the conditions for pass in all the subjects of all the years as stipulated in ***Clause 10.***

13.2 **Maximum Time Limit for completion of B.Tech Degree**

A Student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

13.3 A student (Diploma Holder) admitted under lateral entry into II/IV B.Tech., who fails to fulfill all the academic requirements for the award of the degree within six academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

14.0 **AWARD OF CLASS**

A candidate who becomes eligible for the award of B.Tech. Degree as stipulated in ***Clause 12*** shall be placed in one of the following Classes.

S.No.	Class	CGPA
1	First Class With Distinction	8.0 or more
2	First Class	6.5 or more but less than 8.0
3	Second Class	5.0 or more but less than 6.5

15.0 IMPROVEMENT OF CLASS

15.1 A candidate, after becoming eligible for the award of the Degree, may reappear for the semester end Examination in any of the theory subjects as and when conducted, for the purpose of improving the aggregate and the class. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree.

Candidates shall not be permitted to reappear either for Sessional Examinations or for Semester end Examinations in Practical subjects (including Project Viva-voce) for the purpose of improvement. However, this facility cannot be availed by a candidate who has taken the Original Degree Certificate.

15.2 A single Grade sheet shall be issued to the candidate after incorporating the Credits and Grades secured in subsequent improvements.

15.3 A consolidated Grade Sheet shall be issued to the candidate indicating the CGPA of all the four years put together along with the Provisional Certificate.

16.0 AWARD OF RANK

The rank shall be awarded based on the following:

16.1 Ranks shall be awarded in each branch of study for the top ten percent of the students appearing for the Regular semester end Examinations or the top ten students whichever is lower.

16.2 Only such candidates who pass the Final year examination at the end of the fourth academic year after admission as regular final year student along with others in their batch and become eligible for the award of the Degree shall be eligible for the award of rank. The Rank will be awarded only to those candidates who complete their degree within four academic years.

16.3 For the purpose of awarding rank in each branch, the CGPA calculated based on the Grades secured at the first attempt only shall be considered.

16.4 Award of prizes, scholarships, or any other Honors shall be based on the rank secured by a candidate, consistent with the desire of the Donor, wherever applicable.

17.0 **SUPPLEMENTARY EXAMINATIONS**

In addition to the Regular semester end Examinations held at the end of each semester, Supplementary Examinations will be conducted during the academic year. Such candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one semester end Examination per day.

18.0 **TRANSITORY REGULATIONS**

A Candidate, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of students in which the students joins subsequently. However, exemption will be given to those candidates who have already passed in such courses, which he / she had passed in the earlier semester(s).

18.1 A student, following the Acharya Nagarjuna University (ANU), Guntur, curriculum, detained due to lack of academics/attendance at the end of the first semester of second year, shall join the autonomous batch of third semester. Such students will study all the courses prescribed for that batch, in which the student joins. The first year marks shall not be converted into course credits. However, the student has to clear all the first year backlog subjects by appearing the supplementary examinations, conducted by ANU, Guntur and courses prescribed by Autonomous stream for the award of Degree. The class will be awarded based on the academic performance of a student. Such candidates will be considered on par with lateral entry candidates of autonomous stream and will be governed by regulations applicable to lateral entry candidates' category.

18.2 A student, following ANU, Guntur, curriculum, detained due to lack of academics / attendance at the end of the second semester of second year and also at the subsequent semesters, shall join with the autonomous batch at the appropriate semester. Such

candidates shall be required to pass in all the courses in the programme prescribed by concerned BOS for such batch of students, to be eligible for the award of degree. However, exemption will be given in all those courses of the semester(s) of the batch, which he / she had passed earlier. The student has to clear all his/ her backlog subjects by appearing the supplementary examinations, conducted by ANU, Guntur and College (Autonomous stream) for the award of degree. The class will be awarded based on the academic performance of a student in the autonomous pattern.

19.0 CONDUCT AND DISCIPLINE

(a) Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.

(b) As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

(c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum, indecent behaviour anywhere within or outside the campus.

(ii) Wilful damage of college / individual property

(iii) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(iv) Mutilation or unauthorized possession of library books.

(v) Noisy and unseemly behaviour, disturbing studies of fellow students.

(vi) Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)

(vii) Usage of camera / cell phone in the campus

(viii) Plagiarism of any nature

(ix) Any other acts of gross indiscipline as decided by the academic council from time to time.

(d) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

(e) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.

(f) Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the Principal for taking appropriate action.

(g) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

(h) The institute level standing disciplinary action committee constituted by the academic council, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(i) The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

(j) "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

20.0 MALPRACTICES

20.1 The Principal shall refer the cases of malpractices in internal assessment tests and semester-end examinations to a malpractice enquiry committee constituted by him / her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students basing on the recommendations of the committee.

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

21.0 AMENDMENTS TO REGULATIONS

The College may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabus.

R.V.R. & J.C. COLLEGE OF ENGINEERING, GUNTUR-19.

(AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION

For the batch w.e.f. 2012-2013

ELECTRICAL & ELECTRONICS ENGINEERING

I/IV B.Tech.

FIRST SEMESTER

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture+ Tutorial	Drawing / Practical	Sessional	Semister		
1	BT/CE/CHE/CS/EC/EE/IT/ME - 111	Engineering Mathematics-I	4+1	-	40	60	100	4
2	BT/CE/Ch.E/CS/EC/EE/IT/ME - 112	Engineering Physics-I	3+1	-	40	60	100	3
3	EC/EE/ME-113	Engineering Chemistry - I	3+1	-	40	60	100	3
4	EC/EE/ME-114	C-Programming	4+1	-	40	60	100	4
5	EC/EE 115	Mechanics for Engineers	4+1	-	40	60	100	4
6	EC/EE/ME-151	Chemistry Lab	-	3	40	60	100	2
7	EC/EE/ME-152	Workshop	-	3	40	60	100	2
8	EC/EE/ME-153	C-Programming Lab	-	3	40	60	100	2
		Total	**18+5**	**9**	**320**	**480**	**800**	**24**
		SECOND SEMESTER						
1	BT/CE/CHE/CS/EC/EE/IT/ME - 121	Engineering Mathematics-II	4+1	-	40	60	100	4
2	BT/CE/Ch.E/CS/EC/EE/IT/ME - 122	Engineering Physics-II	3+1	-	40	60	100	3
3	EC/EE/ME - 123	Engineering Chemistry - II	3+1	-	40	60	100	3
4	EC/EE/ME-124	Technical English & Communication Skills	4+1	-	40	60	100	4
5	EC/EE-125	Environmental Studies	4	-	40	60	100	4
6	EC/EE/ME-161	Physics Lab	-	3	40	60	100	4
7	EC/EE/ME-162	English Language Lab	-	3	40	60	100	2
8	EC/EE-163	Engineering Graphics Lab	2	4	40	60	100	2
		Total	**20+4**	**10**	**320**	**480**	**800**	**26**

THIRD SEMESTER

II/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture+ Tutorial	Drawing / Practical	Sessional	Semister		
1	EE/EC/CS/ IT-211	Engineering Mathematics-III	4	-	40	60	100	4
2	EE/EC-212	Circuit Theory	4+1	-	40	60	100	4
3	EE/EC-213	Electromagnetic Field Theory	4	-	40	60	100	4
4	EE/EC-214	Digital Logic Design	4+1	-	40	60	100	4
5.	EE-215	Electronic Devices	4	-	40	60	100	4
6	EE-216	DC Machines	4	-	40	60	100	4
7.	EE 251	Networks & DC Machines Lab	-	3	40	60	100	2
8.	EE 252	Electronic Devices Lab	-	3	40	60	100	2
9.	EE/EC-253	Communication Skills Lab	-	3	40	60	100	2
		Total	**26**	**9**	**360**	**540**	**900**	**30**
FOURTH SEMESTER								
1	EE/EC/CS/ IT-221	Engineering Mathematics-IV	4	-	40	60	100	4
2	EE/EC-222	Data Structures	3+1	-	40	60	100	3
3	EE-223	Electronic Circuits	4	-	40	60	100	4
4	EE-224	Network Analysis	4+1	-	40	60	100	4
5.	EE-225	Mechanical Technology	4	-	40	60	100	4
6	EE- 226	AC Machines	4+1	-	40	60	100	4
7.	EE 261	AC Madchines Lab	-	3	40	60	100	2
8.	EE/EC 262	Data Structures Lab	-	3	40	60	100	2
9.	EE 263	Mechanical Technology Lab	-	3	40	60	100	2
		Total	**26**	**9**	**360**	**540**	**900**	**29**

FIFTH SEMESTER

III/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture/ Tutorial	Drawing / Practical	Sessional	Semister		
1	EE/EC-311	Linear Control Systems	4+1	-	40	60	100	4
2	EE/EC-312	OOPS & OS	3+1	-	40	60	100	3
3	EE-313	Electronic Circuit Analysis	4	-	40	60	100	4
4	EE-314	Generation of Electrical Power	4	-	40	60	100	4
5	EE- 315	Transmission & Distribution	4+1	-	40	60	100	4
6	EE - 316	Synchronous & Special Machines	4+1	-	40	60	100	4
7	EE- 351	Synchronous & Special Machines Lab	-	3	40	60	100	2
8	EE -352	Electronic Circuits Lab	-	3	40	60	100	2
9	EEE -353	Control systems Lab	-	3	40	60	100	2
		Total	**27**	**9**	**360**	**540**	**900**	**29**
		SIXTH SEMESTER						
1	EE/EC321	Linear ICs and Applications	4+1	-	40	60	100	4
2	EE/EC-322	Microprocessors and Microcontrollers	4+1	-	40	60	100	4
3	EE-323	Switch Gear & Protection	3+1	-	40	60	100	3
4	EE-324	Electrical Measurements & Lab Instrumentation	4	-	40	60	100	4
5	EE- 325	Power Electronics	4	-	40	60	100	4
6	EE - 326	Elective-I	4	-	40	60	100	4
7	EE- 361	Electrical Measurements Lab & Workshop practice	-	3	40	60	100	2
8	EE/EC-362	Microprocessors & Microcontrollers Lab	-	3	40	60	100	2
9	EE/EC -363	Advanced Communication Skills Lab	-	3	40	60	100	2
		Total	**26**	**9**	**360**	**540**	**900**	**29**

Elective-I

EE 326/A : High Voltage Engineering
EE326/C : Operations Research
EE 326/E : Digital Signal Processing
EE 326/B : Electrical Machine Design
EE326/D : ANN and Fuzzy Systems

SEVENTH SEMESTER

IV/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture* Tutorial	Drawing / Practical	Sessional	Semister		
1	EE/EC 411	Industrial Management	3+1	-	40	60	100	3
2	EE-412	Power System Operation and Control	4	-	40	60	100	4
3	EE-413	Power System Analysis & Stability	4+1	-	40	60	100	4
4	EE-414	Industrial Drives	4	-	40	60	100	4
5	EE- 415	Elective-II (OPEN)	3+1	-	40	60	100	3
6	EE - 416	Elective - III	4	-	40	60	100	4
7	EE- 451	Power Electronics Lab	-	3	40	60	100	2
8	EE -452	Power Systems Lab	-	3	40	60	100	2
9	EE -453	Term Paper	-	3	100	-	100	2
		Total	**25**	**9**	**420**	**480**	**900**	**28**

Elective - II (Open)
(To be selected other than home branch)

ME 415/A : Robotics
ME 415/B : Operations Research
CE 415/A : Finite Element Method
CE 415/B : Remote Sensing and GIS
BT 415/A : Bio Sensors & Bio Electronics
BT 415 /B : Biomedical Instrumentation
ChE 415/A : Energy Engineering
ChE 415/B : Bio-fuels
CS 415/A : Java Programming
CS 415/B : Database Management Systems
EC415/A : Applied Electronics
EC415/B : Basic Communication
IT 415/A : Web Technologies
IT 415/B : Software Engineering
EE415/A : Renewable Energy Sources
EE415/B : Utilization of Electrical Energy

Elective - III

EE-416/A : HVDC Transmission
EE416/B : Electrical Distribution Systems
EE416/C : Computer organization
EE416/D : Computer Networks
EE416/E : Power Plant Instrumentation

EIGHTH SEMESTER

1	EE-421	Professional Ethics and Human Values	4	-	40	60	100	4
2	EE-422	Utilization of Electrical Power	4	-	40	60	100	4
3	EE-423	Computer Applications to Power Systems	4+1	-	40	60	100	4
4	EE-424	Elective - IV	4	-	40	60	100	4
5	EE- 461	Simulation of Electrical Systems Lab	-	3	40	60	100	2
6	EE-462	Project Work	-	9	80	120	200	10
		Total	**17**	**12**	**220**	**420**	**700**	**28**

Elective - IV

EE 424/A : FACTS Controllers
EE 424/B : EHV AC Transmission
EE 424/C : Digital Control systems
EE 424/D : Embedded Systems & VLSI
EE 424/E : Non Conventional Energy Resources
EE 424/F : Energy Conservation & Audit

I/IV Year B.Tech.- First Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 111

ENGINEERING MATHEMATICS - I

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide knowledge on solving ordinary differential equations and applications of first order ordinary differential equations.*
- *To give basic knowledge on evaluation of double, triple integrals, area and volume.*
- *To provide knowledge and skills in writing a periodic function in its Fourier series form and on their applications.*
- *To develop skills for applying them in future on various engineering applications.*

Learning Outcomes:

- *Understand methods of solving First order and Higher order ordinary differential equations along with some physical applications.*
- *Understand the relation between two variables by Curve fitting.*
- *Able to evaluate double, triple integrals and the area, volume by double & triple integrals respectively.*
- *Understand the concept of Fourier-series representation of periodic functions and their applications.*

COURSE CONTENT :

UNIT - I (15)

Ordinary Differential Equations: Introduction, Linear equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations, Orthogonal trajectories, Newton's law of cooling. Linear differential equations with constant coefficients: Definition, Theorem, Operator D, Rules for finding the complementary function, Inverse operator, Rules for finding the particular integral, working procedure to solve the equation.

UNIT - II (15)

Method of variation of parameters, Equations reducible to linear equations

with constant coefficients. Cauchy's homogeneous linear equation, Legendre's linear equation, Simultaneous linear equations with constant coefficients.

Statistics: Method of least squares, Correlation, Co-efficient of correlation (direct method), Lines of regression.

UNIT - III (15)

Fourier series: Introduction, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Even and Odd functions, half range series. Parseval's formula, Practical harmonic analysis.

UNIT - IV (15)

Multiple Integrals: Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Volume by triple integral, Change of variables in a double integral. Beta, Gamma functions, Error function.

LEARNING RESOURCES:

TEXT BOOK:

Higher Engineering Mathematics by Dr.B.S.Grewal, Khanna Publishers, 40th Edition, 2007.

REFERENCE BOOK:

Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, 2007.

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

I/IV Year B.Tech.- First Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 112
ENGINEERING PHYSICS - I

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *The production & detection of ultrasonics and its applications are presented to emphasize in understanding the medical ultrasound techniques. Superposition principle of light waves and its applications in thin films (wedge, convex shaped) are used to find the various parameters.*
- *For the identification of various vibrational modes of atoms of molecules in materials by laser Raman spectroscopy and in the study of mechanical strains and in the studies of crystals, polarized light and diffraction phenomena can effectively be used.*
- *The basics of laser light, its properties with applications in various fields and its important role played in the preparation of holograms, in analysing the optical spectra and in optical communication are presented.*
- *An overview of Maxwell's E-M equations to understand all the problems encountered in Electromagnetism and the connection to the Optics. The free electron theory and its significance to characterize the electrical and thermal properties of solids and the concept of the Fermi-Dirac distribution function to explain the Fermi energy level in metals.*

Learning Out Comes :

The students will be able to understand:

- *The ultrasonics in various fields of science, engineering & medicine, to recognize the experimental evidence for the wave nature of light and interference in thin films and its technological applications.*
- *Diffraction spectra due to single slit on changing of wavelength and slit width. Concept and various types of polarization can be signified. Nicol prism as polarizer and analyser & its limitations.*

- *Importance of the stimulated emission in producing the lasing beam and its dependence on resonating cavity and active medium. 3D image production & construction and its application using highly monochromatic lasing beam. Guiding light through thin strands of dielectric material and classification.*
- *Propagation of electromagnetic waves through Maxwell's equations, Distinguishing the properties of electrons and Photons.*

Unit -I (16)

Ultrasonics: production of ultrasonics by magnestriction, piezo electric oscillator methods, detection by acoustic grating method, applications in engineering and medicine, ultrasonic testing methods (pulse echo technique, ultrasonic imaging).

Interference*:* superposition principle, young's double slit experiment (qualitative treatment), stoke's principle (change of phase on reflection), interference in thin films due to reflected light (Cosine law), theory of air wedge (fringes produced by a wedge shaped thin film) and theory of newton's rings(reflected system), non-reflecting films.

Unit-II (15)

Diffraction: Fraunhofer diffraction due to a single slit(quantitative), theory of plane transmission diffraction grating, Rayleigh's criterion, resolving power & dispersive power of a grating.

Polarization: introduction, double refraction, construction and working of a nicol prism, nicol prism as a polarizer and analyser, quarter wave plate, production and detection of circular and elliptical polarizations(qualitative), optical activity, specific rotation, kerr and faraday effects.

Unit-III (15)

Lasers: Laser characteristics, spontaneous and stimulated emissions, population inversion, pumping, active system, gas (He-Ne) laser, Nd: YAG laser and semiconductor (GaAs) laser, applications of lasers.

Holography: basic principle, recording, reproduction and applications.

Fiber optics: structure of optical fiber, light propagation through optical fiber-numerical aperture, acceptance angle and acceptance cone, types

of optical fibers, fiber optics in communication system and applications of optical fibres.

Unit-IV (14)

Electromagnetism: induced electric fields, displacement current and conduction current, Maxwell's equation - qualitative (differential & integral forms)-significance, LC oscillations (quantitative), velocity of electromagnetic wave equation in free space , poynting vector.

Statistical Physics : phase space, Maxwell-Boltzmann, Fermi-Dirac & Bose-Einstein's distribution functions(qualitative), photon gas & electron gas.

LEARNING RESOURCES :

TEXT BOOKS :

1. *Engineering Physics - R .K. Gaur & S. L. Gupta , Danpati Rai Publications, Delhi, 2001.*
2. Engineering Physics - Hitendra K. Malik & A.K.Singh, Tata MacGraw Hill, New Delhi,2009.

REFERENCE BOOKS:

1. *Fundamentals of Physics - Resnick & Halliday, John Wiley sons ,9th Edition.*
2. *Engineering Physics - M.N. Avadhanulu & P.G. Kshirasagar, S.Chand & Co.Ltd , 7th Edition.*
3. *Engineering Physics - M.Arumugam, Anuradha Publications, Chennai ,5th Edition , 2006.*
4. *Engineering Physics - B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/engg_physics/index_cont.htm :*
2. *Course relevant website : www.rvrjcce.ac.in/moodle/first year/2011-12/engineeringphysics*

I/IV Year B.Tech.- First Semester

EC/EE/ME/CE/CS/IT - 113
ENGINEERING CHEMISTRY - I

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives :

- *To know the quality parameters of water used in industries and for drinking purpose.*
- *To understand the methods of determining hardness, softening and desalination.*
- *To define the terms associated with phase rule and batteries.*
- *To acquire knowledge on advanced and latest material systems like liquid crystals, composites, etc.,*

Learning Outcomes :

- *Students acquire knowledge on quality and utility of water, useful in studying public health engineering.*
- *Knowledge acquired on phase rule gives good foundation for engineering students. (Specifically to Mechanical Engineering)*
- *Students know suitable replacements of metal after knowing about composite materials.*
- *Able to understand functioning of electrochemical energy systems.*
- *Would be capable of selecting appropriate lubricant for a given system.*

UNIT-I: **(Text book-1)** *(16)*

Water Technology : various impurities of water, , hardness units and determination by EDTA method (simple problems), water technology for industrial purpose: boiler troubles- scales, sludges, caustic embrittlement, boiler corrosion, priming and foaming- causes and prevention. Internal conditioning -phosphate, calgon and carbonate treatment. External conditioning-lime soda process (simple problems), softening by ion exchange process. Desalination of brackish water by electro dialysis and reverse osmosis.

UNIT-II: (Textbook-1) (14)

Water treatment for drinking purpose- WHO guidelines ,sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Phase Rule: Statement and explanation of the terms involved, one component water system, condensed phase rule- construction of phase diagram by thermal analysis, simple eutectic system (Pb-Ag system only) ,applications eutectic compounds.

UNIT-III: (Text book-1) (15)

Electrochemistry: Electrode potential, electrochemical series and its significance, Nernst equation-related problems, Reference electrodes (SHE and Calomel electrode) Ion-selective electrode-glass electrode and measurement of pH.

Electrochemical Energy Systems: Types of electrochemical energy systems, electrochemistry of primary batteries (Lachlanche or dry cell), Secondary cells (Lead Acid cell, Ni-Cd cell), Lithium batteries (Li-MnO_2 Lithium organic electrolyte) and their advantages. Fuel cells(Oxygen-Hydrogen)

UNIT-IV: (Text book-1) (15)

Composites: Introduction, Constituents of Composites, Types -Fibre reinforced, Particulate and layered composites and their applications.

Liquid crystals: Structure of liquid crystal forming compounds, Classification and applications.

Lubricants: Classification ,liquid lubricants- viscosity,Viscosity index, Flash point, Fire point, Cloud point, Pour point, oilyness. Solid lubricants -Graphite and Molybdenum sulphide, Additives, Magnetic Particles.

LEARNING RESOURCES:

TEXT BOOKS :

1. *Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.*
2. *A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.*

REFERENCE BOOKS:

1. *A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.*

WEB REFERENCES:

1. *http://www.wiziq.com/tutorial/*
2. *http://www.powerstream.com/BatteryFAQ.html#lec*
3. *http://www.cdeep.iitb.ac.in/nptel/Core%20Science*

I/IV Year B.Tech.- First Semester

EC/EE/ME - 114 C - PROGRAMMING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam :	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- *Be familiar with computer software and hardware components, how they interact and its block diagram. Understand the basic problem-solving process using algorithm, Flow Charts and pseudo-code development.*
- *Understand the phases of compilation, from preprocessing through linking and loading. Learn how to customize compilation to produce intermediate files, etc*
- *Able to recognize the need for arrays and develop thorough knowledge on the concept of numerical and character arrays and get a better handle on multi- dimensional arrays, pointers, Learn to effectively use pointers for Dynamic memory allocation.*
- *Learn to use structures and unions to create custom data types in C. Have basics in File Operations. Have sound theoretical and practical knowledge in C .*

Learning Outcomes:

- *Thorough understanding of basic components of a computer and their operations.*
- *Thorough knowledge about various phases of compilation, from preprocessing through linking and loading. Learn how to customize compilation to produce intermediate files, etc.*
- *The ability to use the control structures effectively to write efficient programs.*
- *Skills to control program's memory consumption by dynamically allocating and freeing memory as needed.*
- *Have sound theoretical and practical knowledge in C and could effectively use their skills to develop programs for complex applications.*

COURSE CONTENT :

UNIT - I (15)

Introduction: Computer Fundamentals: Computer & it's Components, Hardware / Software, Algorithm, Characterstics of algorithm, Flowchart, Symbols are used in flowchart, history of C, Basic structure of C, C language features.

C Tokens: Character set, Variables, Keywords, Data types and sizes, Type qualifiers, Numeric Constants and their forms of representation, Character Constants, String Constants, Declarations and Initialization of variables.

Operators & Expressions: Arithmetic operators, and expressions, Type-conversion rules, Coercion, Assignment operators and expressions, Increment and decrement operator, Conditional operator, Statements, Preprocessor directives, Input/ Output functions and other library functions. Relational operators and expressions. Boolean operators and expressions.

Programming Exercises for Unit I : C-Expressions for algebraic expressions, Evaluation of arithmetic and boolean expressions. Syntactic errors in a given program, Output of a given program, Values of variables at the end of execution of a program fragment, Filling the blanks in a given program, Computation of values using scientific and Engineering formulae, Finding the largest of three given numbers.

UNIT - II (15)

Conditional Statements: Blocks, If-Else statement, Else-If statement and Switch statement.

Iterative Statements: While loop, For loop, Do-While loop, Break, and continue.

Arrays: One - dimensional and character arrays, Two-dimensional numeric arrays.

Programming Exercises for Unit - II: Computation of discount on different types of products with different ranges of discount Finding the type of triangle formed by the given sides, Computation of income-tax, Computation of Electricity bill, Conversion of lower case character to its

upper case, Finding the class of an input character; Sum of the digits of a given number, Image of a given number, To find whether a given number is-prime; Fibonacci; abundant; perfect, Strong, Amstrong; deficient, Prime factors of a given number, Merging of lists, Transpose of a matrix, Product and sum of matrices, String processing-length of a string; comparison of strings; reversing a string; copying a string, Sorting of names using arrays, Graphics patterns, To print prime numbers and Fibonacci numbers in a given range, and Amicable numbers.

UNIT - III (15)

Functions: Function Definition, types of User Defined Functions, Parameter passing mechanisms, and simple recursion.

Scope & extent: Scope rules, Storage Classes, Multi-file compilation.

Pointers: Pointers Arithmetic, Character array of pointers, Dynamic memory allocation, array of Pointer, Pointer to arrays.

Programming Exercises for Unit - III:

Recursive Functions: factorial, GCD(Greatest Common Divisior),Fibonacci; To evaluate the pointer arithmetic expressions; An interactive program to perform Pointers & Functions - Insertion sort, Bubble sort, Linear search Binary search, Computation of Statistical parameters of a given list of numbers, Counting the number of characters, words and lines in a given text, Table of values of f (x,y) varying x and y; Using Storage Classes to implement the multifile compilation; implement the string operations using Dynamic memory allocation functions;

UNIT - IV (15)

Structures: Structures, Array of structures, structures within structures, Pointer to structures, self referential structures, Unions.

Files: File Handling functions, File error handling functions, Command-line arguments.

Programming Exercises for Unit - IV:

Operations on complex numbers, operations on rational number (p/q form), Matrix operations with size of the matrix as a structure; Frequency count of keywords in an input program, Sorting a list of birth records on name and date of birth using File handling functions, Student marks processing, Library records processing - sorting on name, author, Copy one file to another.

LEARNING RESOURCES:

TEXT BOOK:

1. *Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill, 2010.*
2. *Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997*

REFERENCE BOOKS:

1. *Programming in C by Pradip Dey and Manas Ghosh ,Second Edition, OXFORD*
2. *'C' Programming by K.Balaguruswamy, BPB.*
3. *C Complete Reference, Herbert Sheildt, TMH., 2000*

WEB REFERENCES:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

I/IV Year B.Tech.- First Semester

EC/EE - 115 MECHANICS FOR ENGINEERS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The objectives of the course are to:

- *Study various types of force systems, basic principles of mechanics of rigid bodies and to analyze problems in a simple and logical manner.*
- *Analyze simple trusses using method of joints.*
- *Study and determine centroids and centre of gravity of various standard geometrical shapes.*
- *Learn basic concepts of dry friction on inclined planes and wedges.*
- *Develop an understanding of rectilinear and curvilinear translation of a particle.*
- *Study and analyze the rotation of a rigid body about a fixed axis.*
- *Study the concept of moment of inertia and the mathematical calculations involved in finding moments of inertia of two dimensional areas and material bodies.*

Learning Outcomes :

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

- *Apply principles of mechanics to determine the resultant of several forces acting on a plane.*
- *Determine the axial forces in the members of simple trusses using method of joints.*
- *Determine the centroids and center of gravity of mathematically definable areas as well as composite areas of standard geometrical shapes.*
- *Analyze the problems involving dry frictional contact and wedge friction.*
- *Apply dynamic Equilibrium Equation for rigid bodies under rectilinear and curvilinear translation.*

- *Understand kinematics and kinetics of rotation of a rigid body about a fixed axis.*
- *Calculate the moment of inertia of composite areas and material bodies of standard shapes.*

COURSE CONTENT :

UNIT - I (15)

Introduction: Engineering Mechanics, Basic concepts, system of units.

Concurrent Forces in a Plane: Principles of statics, composition and resolution of forces, equilibrium of concurrent forces in a plane, method of projections, Method of moments.

Non Concurrent Forces in a Plane: Couple, equilibrium of parallel forces in a plane, resultant and equillibrum of general case of forces in a plane, plane trusses-method of joints.

UNIT - II (15)

Centroid and Centre of Gravity: Concept of centroid and centre of gravity, Centroids of simple figures, centroids of composite plane figures Friction: Types of friction, laws of friction, simple contact friction, wedge friction.

UNIT - III (15)

Rectilinear Motion : Kinematics of rectilinear motion, D'Alemberts principle

Curvilinear Motion: Kinematics of curvilinear motion, D'Alembert's principle in curvilinear motion.

Rotation of a Rigid Body about a Fixed Axis: Kinematics of rotation, Equation of motion for a rigid body rotating about a fixed axis.

UNIT - IV (15)

Moment of Inertia of Plane Figures: Moment of inertia of a plane figure with respect to an axis in its plane, polar moment of inertia, parallel axis theorem, moment of inertia of composite areas.

Moment of Inertia of Material Bodies: Moment of inertia of a rigid body, Moment of inertia of a lamina, Moments of inertia of three - dimensional bodies (sphere, right circular cone and cylinder).

LEARNING RESOURCES:

TEXT BOOKS:

1. *Engineering mechanics by S. Timoshenko, D. H. Young and J V Rao -Tata McGraw-Hill Publishing Company Limited, New Delhi(For concepts) , 2009*
2. *Engineering mechanics-statics and dynamics by A. K. Tayal - Umesh publications, Delhi (For numerical problems), 2008.*

REFERENCE BOOKS:

1. *Engineering Mechanics by S.S.Bhavikatti, New Age international Publishers, 2012.*
2. *Engineering Mechanics- Statics and Dynamics by Irving H. Shames, Pearson Education, 2006.*
3. *Singer's Engineering Mechanics: Statics and Dynamics, K.Vijaya Kumar Reddy and J Suresh Kumar, 3rd Edition SI Units-BS Publications, 2010.*
4. *A textbook of Engineering mechanics statics and dynamics by J. L. Meriam and L. Kraige, 6th Edition, Wiley - India, 2010.*

WEB REFERENCES :

1. *www.learnerstv.com / Free-Engineering-Video-lecture-Courses.htm*
2. *htpp://nptel.iitm.ac.in/*
3. *http://en.wikibooks.org/wiki/statics*

I/IV Year B.Tech.- First Semester

EC/EE/ME - 151 CHEMISTRY LAB

Practicals : 3 periods / week		*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam : 3 hrs		*Credits*	*: 2*

Course Objectives :

- *To learn the concepts of equivalent weight, molecular weight, normality, molarity, weight percent, volume percent.*
- *To prepare molar solutions of different compounds.*
- *To know the methods of determining alkalinity, hardness and chloride ion content of water sample.*
- *To know the methods to determining purity of washing soda, percentage of available chlorine in bleaching powder.*
- *To learn the redox methods to determine Fe2+ ions present in solution.*
- *To know principles and methods involved in using instruments like conductivity bridge, spectrophotometer, pH meter and potentiometer*

Learning Outcomes :

- *Students acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.*
- *Students can prepare solutions with different concentrations.*
- *Students can analyze water for its hardness, alkalinity, chloride ion content, iron content.*
- *Students understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.*

(Any 10 out of the following experiments)

01. Determination of total alkalinity of water sample
    a. Standardization of HCl solution.
    b. Determination of alkalinity of water.
02. Determination of purity of washing soda
    a. Standardization of HCl solution.
    b. Determination of percentage purity of washing soda.

03. Estimation of Chlorides in water sample
    a. Standardization of $AgNO_3$ solution.
    b. Estimation of Chlorides in water.
04. Determination of Total Hardness of water sample
    a. Standardization of EDTA solution.
    b. Determination of Total Hardness of water.
05. Estimation of Mohr's salt-Permanganometry
    a. Standardization of $KMnO_4$ solution.
    b. Estimation of Mohr's salt.
06. Estimation of Mohr's salt -Dichrometry
    a. Standardization of $K_2Cr_2O_7$ solution.
    b. Estimation of Mohr's salt.
07. Determination of available chlorine in bleaching powder-Iodometry
    a. Standardization of Hypo.
    b. Determination of available chlorine in bleaching powder.
08. Estimation of Magnesium
    a. Standardization of EDTA solution.
    b. Estimation of Magnesium.
09. Conductometric titration of an acid vs base.
10. Potentiometric titrations: Ferrous Salt vs Dichromate.

Demonstration Experiments:

11. pH metric titrations of an acid vs base.
12. Spectrophotometry: Estimation of Mn/Fe.

I/IV Year B.Tech.- First Semester

EC/EE/ME - 152 WORKSHOP

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To provide the students hands on experience to make different joints in carpentry with hand tools like jack plane, various chisels & hand saws*
- *To provide the students hands on experience to make different joints in welding with tools & equipment like electric arc welding machine, TIG Welding Machine, MIG Welding Machine, hack saws, chipping tools etc.*
- *To provide the students hands on experience to make different joints in Sheet metal work with hand tools like snips, stacks, nylon mallets etc.*
- *To provide the students hands on experience to make different connections in house wiring with hand tools like cutting pliers ,tester ,lamps& lamp holders etc .*

Learning Outcomes:

To familiarize with

- *The Basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.*
- *The production of simple models in the above four trades.*

LIST OF EXPERIMENTS:

Minimum three experiments should be conducted from each trade

1. CARPENTRY

To make the following jobs with hand tools

a) Lap joint

b) Lap Tee joint

c) Dove tail joint

d) Mortise & Tenon joint

e) Cross-Lap joint

2. **WELDING USING ELECTRIC ARC WELDING PROCESS / GAS WELDING.**

The following joints to be welded.

a) Lap joint

b) Tee joint

c) Edge joint

d) Butt joint

e) Corner joint

3. **SHEET METAL OPERATIONS WITH HAND TOOLS.**

a) Rectangular Tray

b) Triangular Tray

c) Pipe Joint

d) Funnel

e) Rectangular Scoop

4. **HOUSE WIRING**

a) To connect one lamp with one switch

b) To connect two lamps with one switch

c) To connect a fluorescent tube

d) Stair case wiring

e) Go down wiring

REFERENCE BOOKS:

1. *Kannaiah P. & Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai, 1999.*
2. *Workshop Lab Manual , R.V.R. & J.C. College of Engineering , Guntur.*

I/IV Year B.Tech.- First Semester

EC/EE/ME - 153 C - PROGRAMMING LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*:60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *Understand the ANSI C/Turbo C compilers.*
- *Be able to develop various menu driven programs using conditional and control flow statements.*
- *Develop programs using structures, unions and files.*
- *Develop 'C' programs for various applications.*
- *Be able to participate and succeed in competitive examinations.*

Learning Outcomes:

- *The ability to develop various menu driven programs like generation of electricity bill, evaluation of series etc.*
- *The practical knowledge to write C programs using 1D, 2D and Multi Dimensional arrays.*
- *Able to write C programs to develop various applications using structures, unions and Files.*
- *Thorough practical knowledge to develop 'C' programs for various applications.*

List of programs (to be recorded)

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement or Switch statement).

Domestic level Consumption As follows:	
Consumption Units	**Rate of Charges(Rs.)**
0 - 200	0.50 per unit
201 - 400	100 plus 0.65 per unit
401 - 600	230 plus 0.80 per unit
601 and above	390 plus 1.00 per unit
Street level Consumption As follows:	
Consumption Units	**Rate of Charges(Rs.)**
0 - 50	0.50 per unit
100 - 200	50 plus 0.6 per unit
201 - 300	100 plus 0.70 per unit
301 and above	200 plus 1.00 per unit

2. Write a C program to evaluate the following (using loops):
   a. 1 + x2/2! + x4 / 4!+ upto ten terms
   b. x +x3/3! + x5/5!+ upto 7 digit accuracy
   c. 1+x+x2/2! +x3/3!+……upto n terms
   d. Sum of 1 + 2+ 3 +……..+n
3. A menu driven program to check the number is (using Loops):
   i) Prime or not
   ii) Perfect or Abundant or deficient
   iii) Armstrong or not
   iv) Strong or not
4. A menu driven program to display statistical parameters (using one -dimensional array)
   i) Mean ii) Median iii) Variance iv) Standard deviation
5. A menu driven program with options (using one -Dimensional array)
   (i) To insert an element into array
   (ii) To delete an element
   (iii) To print elements
   (iv) To remove duplicates
6. A menu driven program with options (using two dimensional array)
   (i) To compute A+B
   (ii) To compute A x B
   (iii) To find transpose of matrix A
   Where A and B are matrices. Conditions related to size to be tested
7. A menu driven program with options (using Two-dimensional Character arrays)
   (i) To insert a student name
   (ii) To delete a name
   (iii) To sort names in alphabetical order
   (iv) To print list of names
8. A menu driven program (using pointers)
   a. Linear search b. Binary search

9. A menu driven program with options (using Dynamic memory allocation)
   a. Bubble sort b. Insertion sort
10. A menu driven program with options (using Character array of pointers)
   (i) To insert a student name (ii) To delete a name
   (iii) To sort names in alphabetical order
   (iv) To print list of names
11. Write a program to perform the following operations on Complex numbers (using Structures & pointers):
   i) Read a Complex number
   ii) Addition of two Rational numbers
   iii) Subtraction of two Complex numbers
   iv) Multiplication of two Complex numbers
   v) Display a Complex number
12. a) Write a C program To copy the one file contents to the another file (using command line arguments).
   b) Write a C Program to count the frequencies of words in a given file.

LEARNING RESOURCES :

TEXT BOOK:

1. *Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill, 2010.*
2. *Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997*

REFERENCE BOOKS:

1. *Programming in C by Pradip Dey and Manas Ghosh ,Second Edition,OXFORD.*
2. *'C' Programming by K.Balaguruswamy, BPB.*
3. *C Complete Reference, Herbert Sheildt, TMH., 2000.*

WEB REFERENCES:

1. *http://cprogramminglanguage.net/*
2. *http://lectures-c.blogspot.com/*
3. *http://www.coronadoenterprises.com/tutorials/c/c_intro.htm*
4. *http://www.cprogramming.com/tutorial/c/lesson1.html*
5. *http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf*

I/IV Year B.Tech.-Second Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 121
ENGINEERING MATHEMATICS - II

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To apply rank concept of matrices in solving linear system of equations, finding the eigen values and eigen vectors and inverse of a matrix and getting familiarity with diagonalization and quadratic forms*
- *To get knowledge of mean value theorems, writing series expansion of functions and finding extreme values or stationary values of functions of two (or) three variables.*
- *To provide sufficient theoretical and analytical background of differentiation and integration of vector functions.*
- *To make the student to learn Laplace and inverse transforms of a function and able to solve differential equation using Laplace transforms.*

Learning Outcomes :

- *Understand the basic linear algebraic concepts.*
- *Assess the importance of derivative in mean value theorems and extreme values.*
- *Able to solve gradient, divergence, curl and integration of vector function problems.*
- *Obtain the solution of differential equation using Laplace transform.*
- *Ability of applying mathematical concepts in relevant engineering applications.*

COURSE CONTENT :

UNIT - I **(15)**

Matrices: Rank of a matrix, vectors, Consistency of linear system of equations, Linear transformations, Characteristic equation, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), Reduction to diagonal form.

UNIT- II (15)

Reduction of quadratic form to canonical form, Nature of a quadratic form, Complex matrices.

Differential Calculus: Rolle's Theorem (without proof), Lagrange's Mean value Theorem (without proof), Taylor's and Maclaurin's Series for single variable (without proof). Maxima and minima of two variables, Lagrange's method of undetermined multipliers.

UNIT-III (15)

Vector Calculus: Scalar and vector point functions, Del applied to scalar point functions, Gradient, Del applied to vector point functions, Physical interpretation of divergence and curl, Del applied twice to point functions, Del applied to products of point functions. Integration of vectors, Line integral, Surface integral, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Volume integral, Gauss divergence theorem (without proof).

UNIT-IV (15)

Laplace Transforms: Introduction, Transforms of elementary functions, properties of Laplace Transforms, Existence conditions, Transforms of derivatives, Transforms of integrals, multiplication by tn, division by t. Evaluation of integrals by Laplace Transforms, Periodic function, Inverse Transforms, Convolution theorem(without proof), Application to Differential equations with constant coefficients.

LEARNING RESOURCES

TEXT BOOK:

Higher Engineering Mathematics by B.S. Grewal, Khanna publishers, 40th edition, 2007.

REFERENCE BOOK:

Advanced Engineering Mathematics by Kreyszig, 8th edition, 2007.

WEB REFERENCES :

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

I/IV Year B.Tech.- Second Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 122

ENGINEERING PHYSICS - II

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To explain the microscopic phenomena occurred in nature through quantum physics and the formation of the band structure and distinction of solids was explained by introducing the famous Kronig-penny model its salient features.*
- *Semiconductor concepts such as Energy band formation and classification of solids, intrinsic & extrinsic semiconductors, Hall effect & photo diode, LED and LCD are presented.*
- *Various magnetic materials and their characterization are presented to enable the student with materials science and to acquaint the student with the super conductivity property etc.*
- *Understanding of dielectric properties and the usage of materials in engineering applications. Introduced the basics of nano world and the various applications that are presently marketed are discussed with XRD and Transmission electron microscope (TEM).*

Learning Out Comes:

After going through these units, the students will be able to understand:

- *The principles of quantum mechanics and the electron theory of metals and their band theory.*
- *Energy band formation and classification of solids & devices based on interaction of light junction diodes.*
- *Classification of Magnetic materials, characterization and their properties. Critical parameters of superconducting materials and applications.*
- *Various types of polarizations; Nano scale materials, properties & applications.*

COURSE CONTENT :

Unit-I (16)

Principles of Quantum Mechanics: de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle-experimental verification, time independent Schrodinger's wave equation, physical significance of the wave function, particle in a box (one dimensional).

Electron Theory of metals: Failures of Classical free electron theory and quantum free electron theory(qualitative).

Band theory of Solids: Bloch theorem (Qualitative), Kronig-Penney model (Qualitative treatment), effective mass of electron.

Unit-II (14)

Semiconductor Physics: Energy band formation in solids, Classification of solids into metals, semiconductors and insulators, intrinsic & extrinsic semiconductors, density of states, intrinsic semiconductor carrier concentration, Hall effect and its uses.

Optoelectronic devices: Photo diode, LED,LCD and solar cell (qualitative treatment).

Unit -III (15)

Magnetic Materials: Introduction, orbital magnetic moment of an electron, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve, soft and hard magnetic materials, Ferrites and their applications.

Superconductivity: Introduction, critical parameters (Tc, Hc, Ic), Meissner effect, types of superconductors, entropy, specific heat, energy gap and isotope effect, BCS Theory(in brief), applications of superconductors, high Tc superconductors(qualitative).

Unit -IV (15)

Dielectric Materials: Fundamental definitions: Electric dipole moment, polarization vector, polarizability, electric displacement, dielectric constant and electric susceptibility. Types of polarizations - Electric and ionic polarizations, internal fields in solids(Lorentz method), Clausius-Mossotti equation, Frequency dependence of polarization, Ferroelectrics and their applications.

Nano Technology : Basic Concepts of Nanotechnology, nano scale, introduction to nano materials, surface to volume ratio, fabrication of nano materials (sol-gel and chemical vapour deposition methods), applications of nano materials. XRD, Transmission Electron Microscope(TEM).

LEARNING RESOURCES:

TEXT BOOKS :

1. *Applied Physics- P. K. Palanisamy, Scitech Publications.*
2. *Materials Science - M.Arumugam, Anuradha Publications, Chennai, 5th Edition , 2006.*

REFERENCE BOOKS :

1. *Materials science - M. Vijaya and G. Rangarajan, TMH, New Delhi*
2. *Solid state physics by A. J. Dekkar*
3. *Physics of atom - Wehr and Richards.*
4. *Engineering Physics - B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses/115104043/1*
2. *http://people.seas.harvard.edu/~jones/ap216/lectures/lectures.html*
3. *http://galileo.phys.virginia.edu/classes/252/home.html*

Course relevant website : www.rvrjcce.ac.in/moodle/first year / 2011-12/ engineeringphysics

I/IV Year B.Tech.- Second Semester

CE/CS/IT/EC/EE/ME - 123

ENGINEERING CHEMISTRY - II

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To acquire knowledge on various polymers and their mechanisms.*
- *To study the mechanisms, different types and factors influencing corrosion.*
- *To acquire knowledge on latest analytical techniques.*
- *To know the importance of green chemistry related to environmental management.*

Learning Outcomes:

- *Students know the utility of plastics in automobile, electronics, electrical and other fields.*
- *Students can relate corrosion and environment and suggest methods to prevent corrosion.*
- *Knowledge acquired on fuels gives good foundation for engineering students.*
- *Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.*
- *Able to design new techniques based on green chemistry principles.*

COURSE CONTENT :

UNIT-I: **(Text book-1 & 2)**

Polymers: Monomer functionality, degree of polymerization, Tacticity, classification of polymerization- addition, condensation and co-polymerization, mechanism of free radical polymerization. (18)
Plastics- Thermoplastic and thermosetting resins, preparation, properties and uses of Bakelite, polyesters, Teflon and PVC. Compounding of plastics.

Conducting polymers: Introduction, examples and applications, Polyacetylene- mechanism of conduction .

Rubber- Processing of latex, Drawbacks of natural rubber- Vulcanization, Synthetic rubbers- Buna-S and Buna-N, polyurethane rubber and silicone rubber.

UNIT-II: **[Textbook-1]**

Corrosion and its control: Introduction, dry corrosion, electrochemical theory of corrosion, Types of corrosion- differential aeration, galvanic (galvanic series), Intergranular and Stress Factors affecting corrosion-oxidizers, pH, over voltage and temperature. (13)

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) corrosion inhibitors- types and mechanism of inhibition, metallic coatings-Galvanization, Tinning, Electroplating (Cu) and electro less plating (Ni)

UNIT-III: **[Text book-1]**

Fuels: Classification of fuels, calorific value, LCV and HCV-units and determination (Bomb calorimeter), Coal- Ranking, proximate and ultimate analysis, carbonization of coal-types (using Beehive oven), Metallurgical coke-properties and uses. (14)

Petroleum based: Fractional distillation, cracking-fixed bed, reforming, composition and uses of petrol, diesel, CNG and LPG.

UNIT-IV: **[Text book-1 & 2]**

Analytical Techniques: Spectroscopy- Beer-Lambert's law, UV and IR-principles, Instrumentation (block diagram), Colorimetry- estimation of Iron, Conductometric (HCl vs NaOH) and potentiometric titrations (Fe(II)vs K2Cr2O7) (15)

Green Chemistry: Introduction, Principles and applications.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.*
2. *A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.*

REFERENCE BOOKS:

1. *A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.*
2. *Principles of Polymer Science, P.Bahadur and N.V. Sastry, Narora Publishing House*

WEB REFERENCES:

1. *http://www.wiziq.com/tutorial/*
2. *http://www.chem1.com/acad/webtext/states/polymers.html*
3. *http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-of-Analysis*
4. *http://www.cdeep.iitb.ac.in/nptel/Core%20Science/*

I/IV Year B.Tech- Second Semester

EC/EE/ME - 124

TECHNICAL ENGLISH & COMMUNICATION SKILLS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *To make the student have better awareness on interpersonal skills and case studies*
- *To establish the importance of the meaning of new vocabulary as well as the form and of showing how words are used in context.*
- *To help the student to develop their overall knowledge and understanding of advanced grammar.*
- *To develop their abilities of written communication related to office communication and also to use foreign expressions situationally.*

Learning outcomes:

- *The student is able to have better inter and intra personal skills and also have good understanding on case studies.*
- *Able to use vocabulary contextually.*
- *Able to learn and applying the knowledge of advanced grammar in the day-to-day life.*
- *Able to develop all kinds of written communication including office communication and also foreign expressions.*

COURSE CONTENT :

Unit - I

1. Kinesis
2. Interpersonal Skills
3. Intrapersonal Skills
4. Case Studies

Unit - II Lexis

1. Vocabulary
2. Analogies
3. Homonymys, Eponyms, Acronyms
4. Confusable words
5. One word substitute

Unit - III Syntax And Advanced Grammar

1. Correction of sentences
2. Advanced grammar
    1. Parallelism
    2. Dangling modifiers
    3. Tantology
    4. Ambiguity
    5. Word order
    6. Shift in tense, mood, voice

Unit - IV Office Communication

1. Letter writing
2. Memos
3. E-mail
4. Note taking, Note making
5. Routing slips
6. Foreign Expressions
    a. French -20
    b. Spanish - 10
    c. Italian/Latin - 20
    d Japanese - 10
    e. German - 10
    f. Russian - 10
    g. Chinese - 10

LEARNING RESOURCES

TEXT BOOKS :

1. *Communication Skills - Sanjay Kumar & Pushpa Latha (OUP)- 2nd Impression, 2012*

REFERENCE BOOKS :

1. *Technical Communication - Meenakshi Raman & Sangeeta Sharma, Oxford Semester Press, 6th Impression, 2012*
2. *Oxford Dictionary of English Idioms - John Ayto, OUP Oxford, 08-Jul-2010*
3. *Dictionary of word origins - John Ayto, Bloomsbury, 2001*
4. *Harbrace Hand book of English*
5. *Mc Graw Hill's Hand Book of English Grammar and Usage - Markm Lysstar, Larry Beason, 2005*
6. *College Hand book*

I/IV Year B.Tech.- Second Semester

EE/EC - 125 ENVIRONMENTAL STUDIES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: -- period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *To Create an awareness on various environmental pollution aspects and issues*
- *To give a comprehensive insight into natural resources , eco system and bio diversity*
- *To educate the ways and means to protect the environment from various types of pollution*
- *To impart some fundamental knowledge on human welfare measures and environmental acts*
- *To demonstrate the environmental problems like global warming , ozone layer depletion and acid rains.*

Learning Outcomes :

The students are able

- *To define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.*
- *To describe and discuss the environmental implications of the cycles of biologically important materials through the eco system.*
- *To discuss the benefits of sustaining each of the following resources; food, health , habitats, energy , water ,air , soil and minerals*
- *To understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies*

COURSE CONTENT :

UNIT - I

Introduction:

Definition, Scope and Importance.

Natural Resources:

Forest Resources: Use and over-exploitation, Deforestation, Mining, dams and their effects on forests and tribal people.

Water Resources: Use and over-utilization of surface and ground water, floods and droughts, Water logging and salinity, Dams - benefits and problems, Conflicts over water.

Energy resources: Energy needs, Renewable and non-renewable energy sources.

Land resources: Land as a resource, land degradation, soil erosion & desertification, Effects of modern agriculture on land resources.

Ecosystems: Definition, Structure and functions of an Ecosystems, Biogeochemical cycles-water, carbon, nitrogen and water cycles, Types-Forest, Greenland, Desert, Aquaticecosystem.

UNIT-II

Biodiversity and its Conservation: Definition, Value of biodiversity. Bio-geographical classification of India, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to bio-diversity, Endemic and endangered species of India, Conservation of biodiversity.

Environmental Pollution: Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear pollution, Solid waste management.

UNIT-III

Social Issues and Environment: From unsustainable to sustainable development, Population growth and environment, Green revolution, Rain water harvesting, watershed management, cloud seeding, Resettlement and rehabilitation of people - problems and concerns, Environmental Impact Assessment.

Climate Changes : Global warming & Green house effect, Acid rain, Ozone layer depletion.

UNIT-IV

Environmental acts: Prevention and Control of Water pollution & Air Pollution act, Environmental protection act, Wild life protection act, Forest Conservation act.

International Conventions: Stockholm Conference 1972, Earth Summit 1992. Copenhagen Summit 2009.

Case Studies: Chipko movement, Narmada Bachao Andolan, Silent Valley Project, Madhura Refinery and Taj Mahal, Chernobyl Nuclear Disaster, Ralegaon Siddhi, Florosis and Bhopal Tragedy.

Field work:

Visit to a local area to document environmental assets - river/ forest/ grassland / hill /mountain.

Study of local environment-common plants, insects, birds.

Study of simple ecosystems - pond, river, hill, slopes etc.

Visits to industries, water treatment plants, effluent treatment plants.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Environmental Studies, by Dr. Suresh K. Dhameja, Published by S.K. Kataria & Sons, Ludhiana., 2009-10.*

REFERENCE BOOKS:

1. *Environmental studies by Anubha Kaushik and C.P.Kaushik., New Age International Publishers, New Delhi., 3rd Edition, 2012.*
2. *T Benny Joseph, Environmental Studies, the Tata McGraw-Hill Publishing Company Limited, New Delhi., 3rd print, 2006.*

I/IV Year B.Tech.- Second Semester

EC/EE/ME - 161 Physics Lab

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 2*

Course Objectives:

- *To give students a background in experimental techniques and to reinforce instruction in physical principles*
- *Experiments are designed to incorporate lessons on measurement, data, error, or graphical analysis in addition to illustrating a physical principle.*
- *Give skills that can transfer critical thinking into problem solving methods. How to identify what data is important, how to collect that data, and then draw conclusions from it.*

Learning Outcomes:

After going through lab manual and experiments, the students will be able to understand:

- *Know, understand, and use a broad range of basic physical principles.*
- *a working capability with mathematics, numerical methods, and application of solutions.*
- *Will have a wide idea on various components & instruments.*
- *Additional problem -solving skills and practical experience are through design projects and laboratory assignments, which also provide opportunities for developing team- building and technical communication skills.*
- *Have an ability to learn independently.*

LIST OF EXPERIMENTS

(Any 10 out of the following experiments)

1. Interference fringes - measurement of thickness of a foil using wedge method.
2. Newton's rings - measurement of radius of curvature of Plano- convex lens.

3. Lissajous' figures - calibration of an audio oscillator.
4. Photo cell - characteristic curves and determination of stopping potential.
5. Diffrraction grating - measurement of wavelengths.
6. Torsional pendulum - determination of Rigidity modulus of a wire.
7. Photo-Voltaic cell - determination of fill factor.
8. Series LCR resonance circuit -determination of Q factor.
9. Sonometer - determination of A.C. frequency.
10. Laser - determination of single slit diffraction.
11. B - H Curve.
12. Optical Fiber - Determination of Numerical Aperture and Acceptance Angle.

REFERENCE BOOK :

Physics Lab Manual , R.V.R. & J.C. College of Engineering , Guntur.

I/IV Year B.Tech.- Second Semester

EE/EC/ME - 162 English Language Lab

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To identify various reasons for incorrect pronunciation and make the student understand and learn Standard Pronunciation, i.e., R.P.*
- *To develop skills to describe something, participate and present various presentations interesting and captivating.*
- *To provide sufficient understanding on the importance of reading and get to know the basic hurdles in efficient reading.*
- *To give a comprehensive understanding of having good vocabulary and learn large number of words.*
- *To make the student learn within a context by working out some situations using phrasal verbs and idioms.*

Learning Outcomes:

- *The student is able to speak with Standard Pronunciation.*
- *Able to participate in activities and make better presentations.*
- *Able to develop good and efficient reading skills.*
- *Able to acquire sufficient knowledge on vocabulary and also use them in day-to-day life.*
- *Able to use phrasal verbs and idiomatic expressions situationally.*

Phonetics

Introduction - Reasons for Incorrect Pronunciation - Received Pronunciation - Misconception about sounds. Sounds - Vowels - Consonants - Transcription - Problems of Indian English - Syllable - Word Stress - Weak Forms - Intonation.

Interactions : Dynamics of Professional Presentations - Individual & Group Presentations - Delivering Just-a-minute (JAM) Sessions - Body Language - Group Discussions - Job Interviews- Public Speaking - Making

Speeches Interesting - Delivering Different types of Speeches - Conversations, Dialogues and Debates - Features of a Good Conversation - Short Conversations - Telephonic Skills - Debate - Situational Dialogues.

Reading comprehension :

The Art of Effective Reading - Benefits of Effective Reading - Types - Methods of Reading - Different Passages for Reading Comprehension - Reading Comprehension - Identifying the Central Idea - Inferring Lexical and Contextual Meaning.

Word origins : Introduction - Word Formation - Synonyms- Antonyms - Learning words through Situations - Substitution - Idioms - Phrasal Verbs - Developing Technical Vocabulary.

Idioms and phrases : What are phrasal verbs? What they mean? Particles in phrasal verbs - Nouns and Adjectives based on Phrasal Verbs. Types of Idioms - Idioms for Situations - Idioms that comment on People, Stories & Reports.

LEARNING RESOURCES:

TEXT BOOKS :

1. *Keep talking- Communicative fluency activities for language teaching, - Fiederike Klippelr, Cambridge Semester Press.*
2. *At the chalk face- Practical Techniques in Language Teaching - Alan Matthews,Mary spratt, Les Dangerfield, ELBS*
3. *Games for Language Learning - Andrew Wright, David Betteridge, Miclael Buckby, Cambridge Semester Press.*
4. *Interactive classroom activities. (10 titles - Cambridge Publication)*
5. *Better English Pronunciation - J.D.O' Connor, Second Edition, 2009, Cambridge Semester Press.*

SOFTWARE :

1. *Author plus - clarity*
2. *Call centre communication - clarity*

I/IV Year B.Tech.- Second Semester

EE/EC - 163 ENGINEERING GRAPHICS LAB

Practicals	*: 2 periods / week*	*Sessional Marks*	*: 40*
Drawing	*: 4 periods /week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Comprehend general projection theory with emphasis on orthographic projection to represent three dimensional objects in two dimensional views.*
- *Construct letters & Numerals in a legible freehand form*
- *To be able to plan and prepare neat orthographic drawings of points, Straight lines, Regular planes and solids*
- *Draw and identify various types of section and Auxiliary views*
- *To enable the students the aspects of development of surfaces in sheet metal working*
- *Introduce Auto CAD software for the creation of basic entities and usage of different tool bars.*

Learning outcomes:

- *Acquire basic skills in Technical graphic communication*
- *The students will be able to visualize and communicate with 2D as well as three dimensional shapes.*
- *Understands the application of Industry standards and best practices applied in Engineering Graphics*
- *The student is able to apply the knowledge of development of surfaces in real life situations*
- *Student is introduced to modern CAD system using Auto CAD.*
- *The students will be able to draw simple 2D Engineering Drawings using Auto CAD.*

(To be taught & examined in First angle projection)

General : Use of Drawing instruments, Lettering .-Single stroke letters, Dimensioning-Representation of various type lines. Geometrical Constructions. Representative fraction.

Curves : Curves used in Engineering practice - conic sections - general construction and special methods for ellipse, parabola and hyperbola. cycloidal curves - cycloid, epicycloid and hypocycloid; involute of circle and Archemedian spiral.

Method of Projections: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

Projections of Planes : Projections of planes, projections on auxiliary planes.

Projections of Solids : Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

Sections Of Solids: Sections of Cubes, Prisms, Pyramids, cylinders and Cones. true shapes of sections. (Limited to the Section Planes perpendicular to one of the Principal Planes).

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones.

Isometric Projections : Isometric Projection and conversion of Orthographic Projections into isometric views. (Treatment is limited to simple objects only).

ORTHOGRAPHIC PROJECTIONS : Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).(Demonstration only)

COMPUTER AIDED DRAFTING(Using any standard package) (Demonstration only) : Setting upa drawing: starting , main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen, units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

PRACTICE OF 2D DRAWINGS: Exercises of Orthographic views for simple solids using all commands in various tool bars.

LEARNING RESOURCES

TEXT BOOK:

1. *Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand), Charotar publishing house , 50th Edition,2010.*

REFERENCE BOOK:

1. *Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah, Scitech Publications , 2010.*
2. *Engineering Graphics with AutoCAD 2002 by James D. Bethune , PHI , 2011*

WEB REFERENCES

1. *www.wikipedia.com*
2. *NPTEL Lectures*

II/IV Year B.Tech.- Third Semester

EE/EC-211 ENGINEERING MATHEMATICS - III

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: --- period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide to the students with a strong foundation in Mathematics, Basic & Engineering Sciences and core area Knowledge through rigorous education to enable him to pursue higher education / take up employment in India / board.*
- *To provide students with a solid foundation in Electrical & Electronics Engineering and allied subjects to enable him to solve technological problems related to Electrical & Electronics Engineering.*
- *To provide basic knowledge of numerical methods including solving systems of linear equations, numerical quadrature and numerical solution to ordinary and partial differential equations.*
- *To develop and implement a prototype of a mathematical assignment to connect Fourier transforms to real world problems.*

Learning Outcomes:

- *An ability to apply knowledge of Applied Mathematics, Basic Engineering sciences.*
- *An ability to identify, formulate and solve Electrical Engineering Problems.*
- *An ability to carry out interdisciplinary programs and research in National/International organizations.*
- *To solve linear system of equations numerically and to solve algebra equation by Newton-Raphson method.*
- *Apply Euler's method, fourth order Runge-Kutte method to advance a single ordinary differential equation for one or two steps of the independent variable.*
- *Improve capabilities in differential equation of interest to electrical and electronic communication and computer engineers.*

- *Make the students learn certain important methods used for solving partial differential equations exactly and approximately.*
- *Solve the first order linear and non linear, higher order homogeneous linear and nonlinear partial differential equations.*

COURSE CONTENT :

UNIT - I

Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations solvable by direct integration, Linear equations of the first order, Non-Linear equations of the first order using Charpit's Method, Homogeneous Linear Equations with Constant Coefficients, Rules for finding the Complementary Function, Rules for finding the Particular Integral, Non-Homogeneous Linear Equations. (15)

UNIT - II

Integral Transforms: Introduction, Definition, Fourier Integral Theorem (without proof), Fourier sine and cosine integrals, Complex form of the Fourier Integral, Fourier Transforms, Properties of Fourier transforms, Finite Fourier sine and cosine transforms,

Numerical Methods: Solution of Algebraic and Transcendental Equations: Introduction, Newton-Raphson Method, Solution of Linear Simultaneous Equations: Gauss Seidel Iterative Method. (15)

UNIT - III

Finite Differences & Interpolation: Introduction, Finite difference operators, Symbolic relations, Differences of a polynomial, Newton's forward and backward interpolation formulae, Central difference interpolation formulae- Stirling's formulae, Interpolation with Unequal intervals: Lagrange's Interpolation, inverse interpolation.

Numerical Differentiation: Finding first and second order Differentials using Newton's formulae. (15)

UNIT - IV

Numerical Integration: Trapezoidal rule, Simpson's one-third rule.

Numerical Solutions of Ordinary Differential Equations (first order): Picard's Method, Euler's Method, Runge-Kutta Method of fourth order, Simultaneous equations (R K method).

Numerical Solutions of Partial Differential Equations: Classification of Partial Differential Equation of second order, Solutions of Laplace's and Poisson's Equations by iteration methods. (15)

LEARNING RESOURCES:

TEXT BOOK:

Higher Engineering Mathematics, B.S. Grewal, 40th edition, Khanna publishers, New Delhi.

REFERENCE BOOKS:

1. *Advanced Engineering Mathematics by Erwin Kreyszig*
2. *A text book of Engineering Mathematics by N.P. Bali.*

II/IV Year B.Tech.-Third Semester

EE/EC - 212 CIRCUIT THEORY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To develop an understanding of the fundamental laws and elements of electrical circuits.*
- *To learn the energy properties of electric elements and the techniques to measure voltage and current.*
- *To develop the ability to apply circuit analysis to DC and AC circuits.*
- *To understand transient and steady-state response of RLC circuits.*
- *To understand advanced mathematical methods such as Laplace transforms for solving circuit problems.*
- *To provide an exposure to P-Spice.*

Learning Outcomes:

- *To be able to understand basic electrical properties.*
- *To be able to analyze electrical circuits.*
- *To be able to understand transient and steady- state response.*
- *To be able to find circuit response using Laplace Transform.*
- *To be able to simulate electrical circuits using P-Spice.*

COURSE CONTENT :

UNIT - I

INTRODUCTION OF CIRCUIT ELEMENTS: [Text Book 2]

Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, Active and Passive circuit elements; Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division; V-I characteristics of Passive elements and their series / parallel combination; Star Delta transformation, Energy stored in Inductors and Capacitors Kirchhoff's Voltage law and Kirchhoff's Current law.

GRAPH THEORY: [Text Book 3]

Introduction to Graph Theory, Tree, Branch, Link, Cutset and loop matrices, relationship among various matrices and parameters, Mesh and Nodal Analysis. [15]

UNIT - II

INTRODUCTION TO ALTERNATING CURRENTS AND VOLTAGES: [Text Book 3]

Instantaneous, Peak, Average and RMS values of various waveforms; Crest factor, Form factor; Concept of phase and phase difference in sinusoidal waveforms; Phase relation in pure resistor, Inductor and capacitor; Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits.

POWER AND POWER FACTOR [Text Book 3]

Computation of active, reactive and complex powers; power factor. [15]

UNIT - III

NETWORK THEOREMS: [Text Book 1]

Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegan's and Millman's theorems, Application of theorems to DC circuits. Sinusoidal steady state Mesh and Node Analysis. Application of network theorems to AC circuits.

RESONANCE: [Text Book 3]

Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with frequency , Q factor, magnification, reactance curves in parallel resonance. [15]

UNIT - IV

TRANSIENTS AND LAPLACE TRANSFORMS: [Text Book 1]

Steady state and transient response, DC and Sinusoidal response of an R-L, R-C, R-L-C circuits.

Laplace Transforms of typical signals, periodic functions, Inverse transforms, Initial and final value theorems, Application of Laplace transforms in circuit analysis.

PSPICE: [Text Book 3]

Introduction to PSpice: D.C Analysis and control statements, dependent sources, DC Sweep, AC Analysis and control statements, Transient analysis. [15]

LEARNING RESOURCES

TEXT BOOKS:

1. *William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 6th Edition,TMH, 2002.*
2. *M.E.Vanvalkenburg, Network Analysis, 3rd Edition, PHI, 2003.*
3. *A Sudhakar and Shyam Mohan SP, Circuits and Networks: Analysis and Synthesis, 4th Edition, TMH, 2010*

REFERENCE BOOKS:

1. *Franklin F.Kuo, Network Analysis and Synthesis, 2nd Edition, John Wiley & Sons, 2003.*
2. *Mahmood Nahvi and Joseph Edminister, Electric Circuits, 4th Edition, Schaum's outline series, TMH, 2004.*

WEB REFERENCES:

1. *www.ece.umd.edu/class/enee204.../LectureNOtes/LectureMain.html*
2. *http://www.ee.washington.edu/faculty/soma/fipse/faculty_guide.pdf*

II/IV Year B.Tech.-Third Semester

EE/EC- 213 ELECTROMAGNETIC FIELD THEORY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: -- period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *To develop an understanding of electromagnetic field fundamentals by emphasizing both mathematical analytical rigor and physical conceptual reasoning as applied toward practical engineering problems.*
- *To provide an ability to analyze engineering systems based on electrostatic fields, steady electric currents, magneto static fields in arbitrary material media and to apply vector calculus to solve a large variety of static field problems.*
- *To develop a solid grasp and true appreciation of Maxwell's equations and use these equations to solve time varying field problems.*

Learning Outcomes :

- *Able to appreciate fields.*
- *Able to solve realistic electromagnetic field problems utilizing physical conceptual reasoning and mathematical synthesis of solutions.*
- *Able to understand electric and magnetic properties of material media and how these properties can be exploited in engineering applications.*
- *Able to utilize three dimensional vector differential and integral concepts to solve real life electromagnetic field problems.*
- *Able to understand electromagnetic wave propagation.*

COURSE CONTENT :

UNIT - I

Electrostatics -I: [Text Book 1]

The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Guass's law Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, The line integral, Definition

of potential and potential difference. The potential field of a point charge, system of charges, potential gradient, the dipole and Energy density in electrostatic field. (17)

UNIT - II

Electrostatics - II: [Text Book 1]

Current and current density, continuity of current, conductor properties and boundary conditions. The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two wire line. Derivations of Poisson's and Laplace's equations, Examples of the solution of Laplace's equation. (13)

UNIT - III [Text Book 1]

The Steady Magnetic Field: Biot-Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials

Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields. (14)

UNIT - IV [Text Book 1]

Time Varying Fields and Maxwell's Equations: Faraday's law, Displacement current, Maxwell's equations in point form, integral form. [Text Book 2]

Electromagnetic waves: Solution for free space conditions, Uniform plane wave propagation, Uniform Plane waves, Wave Equations for conducting medium, Sinusoidal Time variations. Conductors and dielectrics, Polarization, Direction Cosines, Reflection by Perfect conductor- normal incidence, Oblique Incidence, Reflection by Perfect Dielectric - Normal Incidence, Oblique Incidence, Poynting's theorem, (16)

LEARNING RESOURCES:

TEXT BOOKS:

1. *W H Hayt, J A Buck Engineering Electromagnetics, 7th Edition TMH, 2006.*
2. *EC Jordan and KG Balmain, Electromagnetic Waves and Radiating Systems, PHI 2003.*

REFERENCE BOOKS:

1. *G S N Raju, Electromagnetic Field Theory and transmission lines, 1st Edition, Pearson Education India,2005.*
2. *Joseph A Edminister, Theory and Problems of Electromagnetics, 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993*
3. *Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press, 2003.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/em/index.htm*
2. *www.mike-willis.com/Tutorial/PF2.html*

II/IV Year B.Tech.-Third Semester

EE/EC- 214 DIGITAL LOGIC DESIGN

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *To understand different types of number systems used in digital systems. Boolean algebra concepts which are used to describe mathematical relationship between input and output signals.*
- *To understand Karnaugh maps and tabulation method which are used to construct combinational circuits.*
- *To understand about the memory elements such as flip-flops, counters, registers.*
- *To understand about the programmable logic devices like PAL, PLA and different types of IC logic families.*

Learning Outcomes:

- *Understand the basic digital logic fundamentals such as numbering system, binary codes and Boolean algebra*
- *Understand various methods and techniques to simplify the Boolean algebra functions.*
- *Able to design the various digital circuits like encoders, decoders and counters.*
- *Become familiar with different types of memory elements and IC logic families.*

COURSE CONTENT :

UNIT - I [Text Book 1]

NUMBER SYSTEMS AND CODES: Decimal, Binary, Octal, Hexadecimal Number systems and their conversions, Arithmetic additions, subtraction using the method of complements, Multiplication and division. Codes: BCD, Excess 3, Gray, Alphanumeric and Error detection codes.

BOOLEAN ALGEBRA: Boolean expressions and theorems, Logic gates, Universal gates, Canonical and standard forms, Boolean functions, simplification of Boolean functions using K maps (up to five variables), Minimal functions and their properties, Tabulation method, NAND implementations two level and Multilevel. (19)

UNIT - II [Text Book 1]

COMBINATIONAL LOGIC CIRCUITS: EX-OR, EX-NOR Circuits, General design procedure for Combinational logic circuits, Design and applications of Binary Adders and Subtractors, Comparators, Encoders, Decoders, Multiplexers and Demultiplexers, Design of BCD to 7 Segment Decoder, Parity Generator and Checker, Error Detection and Correction using Hamming Code, BCD Adder / Subtractor, Carry look ahead adders. (16)

UNIT - III [Text Book1]

SEQUENTIAL LOGIC CIRCUITS: Latches, Characteristic Table, Characteristic Equation, Excitation table, State table and State diagrams for SR, JK, Master Slave JK, D and T Flip-flops, Conversion from one type of Flip-flop to another, Shift Registers, Analysis and Synthesis of Sequential Circuits-Sequence Generator, Sequence Detector, Parity Generator.

COUNTERS USING FLIP- FLOPS: Design of Ripple counters, Synchronous counters, Up/Down counters using Flip-flops. (14)

UNIT - IV [Text Book 1]

IC LOGIC FAMILIES: RTL, DTL, TTL, ECL, MOS, CMOS and IIL families and their comparison.

Programmable Logic Devices: Programmable Logic Arrays (PLA), Programmable Array Logic (PAL), CPLD,FPGA. (11)

LEARNING RESOURCES:

TEXT BOOKS:

1. *M Morris Mano, Digital Logic and Computer Design, PHI/Pearson Education, 2003.*
2. *RP Jain, Modern Digital Electronics, 3rd Edition, TMH, 2003*
3. *Fundamentals of Digital Circuits, A.Anand Kumar,4th Edition,Pearson Education.*

REFERENCE BOOKS:

1. *Zvi Kohavi, Switching and Finite Automata Theory, 2nd Edition, TMH, 1978*
2. *Taub and Schilling, Digital Integrated Electronics, Mc-Graw Hill, 1977.*

WEB REFERENCES:

1. *http://www.ece.ubc.ca/~saifz/eece256.htm*
2. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-* %20Guwahati/digital_circuit/frame /index.html

II/IV Year B.Tech.- Third Semester

EE -215 ELECTRONIC DEVICES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- To understand semiconductor basics like semiconductor material, its types, concepts of Drift current, diffusion current.
- To understand the principle of operation and characteristics of all Electronic Devices i.e., Diode, transistor, FET, UJT, Tunnel Diode and Power devices such as SCR, DIAC, TRIAC.
- To analyze the transistor biasing and thermal stabilization of transistor and its compensation techniques.
- To understand the principle of operation and characteristics of Photo Devices i.e., LED, LCD, Photo multiplier tubes & Photo transistor.

Learning outcomes:

- Will have a wide idea on Specifications of various Electronic devices.
- Can know about Various Electronic devices and their operation.
- Can able to design the various Equipment which are used in the manufacturing and operation of electronic devices.
- Will have an idea about Electronic devices Engineering Laboratory and the Equipments used for measuring and testing different types of materials.

COURSE CONTENT :

UNIT - I [Text Book- 1]

Conduction in Semiconductors :

Classification of materials based on energy band diagram, Conductivity of a semiconductor, Carrier concentration in an intrinsic semiconductor, Fermi level in an intrinsic semiconductor, Law of mass action, Donor and acceptor impurities, Charge densities in a semiconductor, Fermi level in a semiconductor having impurities, Diffusion, Carrier life time, Continuity equation, Diffusion length, Hall effect. (21)

UNIT - II [Text Book- 1&2]

Semiconductor Diodes : Quantitative theory of P-N junction diode, V - I Characteristics and its temperature dependence, Transition and Diffusion capacitances of P-N junction diode, Limitations and specifications of diodes, Break down of junctions under reverse bias. Avalanche Diode, Zener Diode, Varactor Diode, Tunnel Diode, Photo Diode, LED and LCD: Characteristics and areas of applications. (16)

UNIT - III [Text Book- 2&3]

Junction Transistor: NPN & PNP junction transistors, Transistor current components, Transistor as an Amplifier, CB, CE and CC configurations and their characteristics, DC bias and its stabilization, Various Stabilization and Compensation circuits, Thermal runaway and thermal stability, Phototransistor. (14)

UNIT - IV [Text Book- 2&3]

Unipolar Devices: JFET, Depletion-MOSFET, and Enhancement-MOSFET: Basic construction, operation, Drain and Transfer characteristics, FET Parameters - r_d, g_m, μ, biasing methods. UJT: Basic construction, electrical equivalent circuit and operation, emitter characteristics.

Power Devices: P-N-P-N Devices, SCR-Two transistor analogy and characteristics, DIAC and TRIAC: their characteristics only. (13)

LEARNING RESOURCES :

TEXT BOOKS:

1. *Donald A. Neamen, Semiconductor Physics and Devices, 3rd Edition, Tata McGraw-Hill, Edition,2007.*
2. *Jacob Millman and Christos C Halkias, Integrated Electronics, TMH, 2002.*
3. *Robert L Boylested and Louis Nashelsky, Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003.*

REFERENCE BOOKS:

1. *Jacob Millman and Christos C Halkias, Electronic Devices and Circuits, Tata McGraw-HillEdition,1991.*
2. *N N Bhargava, D C Kulshreshtha, S C Gupta, Basic Electronics and Linear Circuits, Tata, McGraw-Hill Edition, 2008.*

3. *S Salivahanan, N Suresh Kumar, Electronic Devices and Circuits,Tata McGraw-Hill, Edition,2011.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses.php?branch=Ece*
2. *http://www.deas.harvard.edu/courses/es/154/*
3. *http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits- and-electronics- spring-2007*
4. *http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-012- microelectronic-devices-and-circuits-spring-2009/*

II/IV Year B.Tech.- Third Semester

EE -216 DC MACHINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

Main objectives of this course are

- *To explain basic concepts underlying D.C electrical machines, their control and testing.*
- *To cover electro mechanical energy conversion and magnetic circuits.*
- *To teach constructional, operational details of D.C machine along with mathematical equations.*
- *To discuss the requirements of parallel operation.*
- *To teach different speed control techniques& various tests on dc machine etc.,*

Learning outcomes:

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

- *Analyze the performance of dc machines and their utilization in different applications.*
- *Find out the efficiency of a dc machine by performing any test (no load/load test) on dc machine.*
- *Analyze the electro mechanical energy conversion in a dc machine.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications.*
- *Get solutions for problems related to electrical machines in competitive examinations.*

COURSE CONTENT :

UNIT - I [Text book -2]

Magnetic Circuits: Introduction - simple magnetic circuit - magnetic circuits with air gap - Air-gap fringing fields - Magnetic equivalent circuit - properties of magnetic materials - Hysteresis and eddy current losses - permanent magnetic materials.

Electro Mechanical Energy Conversions: Energy in Magnetic system - field energy and mechanical force - mechanical energy. Torques in systems with permanent magnets. (11)

UNIT - II [Text book -1, Text book -2,Reference book-1]

D.C. Machines: Principles - constructional features - operation of DC generators and motors. Types of Windings - lap and wave.

Armature reaction and compensations - commutation and inter poles. No load and load characteristics of all types of DC generators and their applications. (13)

UNIT-III [Text book -1, Text book -2,Reference book-1]

Parallel operation of D.C. generators - characteristics of DC Motors - applications - DC motor starters and their design - speed control of DC shunt, series and compound motors. (18)

UNIT - IV [Text book -1, Text book -2,Reference book-1]

Losses,efficiency and testing of DC machines - Swinburne's - Hopkinson's - retardation - Field Test etc., Principle of operation of Amplidyne and Metadyne. (11)

LEARNING RESOURCES:

TEXT BOOKS :

1. Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition.

2. Electric Machines by I.J. Nagrath& D.P. Kothari, Tata McGraw - Hill Publishers

3. Electrical Machines by SamarjitGhosh, Pearson 2nd edition, 2008.

REFERENCE BOOKS:

1. *Theory & performance of Electric Machines, by J. B. Gupta, S.K. Kataria& Sons.*
2. *Electric Machinery & Transformers by Irving L. Kosow , PHI.*
3. *Performance and Design of D.C Machines - by Clayton & Hancock, BPB Publishers.*
4. *Electro mechanics - I (D.C. Machines) S. Kamakshaiah Right Publishers.*
5. *Electric Machinary-A.E. Fritzgerald, C. Kingsley &S. Umans, McGraw-Hill Companies, 6thediton 2003.*

WEB REFERENCES:

1. *www.nptel.iitm.ac.in/courses/IIT-MADRAS/Electrical_Machines.../2_1.pdf*
2. *www.gtbit.org/downloads/emecsem3/emecsem3n4qbank.pdf*
3. *www.freevideolectures.com*
4. *www.swe.siemens.com/spain/web/.../Catalogo%20motores%20cc.pdf*
5. *www.einsteincollege.ac.in/Assets/.../electrical%20engg%20notes.pdf*

II/IV Year B.Tech.- Third Semester

EE -251 NETWORKS & DC MACHINES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

The main objectives of this lab course are

- *To conduct experiments on theory taught in electrical circuits, electrical machines.*
- *To design experimental setups for theorems.*
- *To conduct experiments on DC machines (Generator, motor).*
- *To introduce PSpice as simulation tool for circuits.*
- *To conduct nodal analysis, superposition theorem using PSpice, Field's test on DC series MG set.*

Learning outcomes:

The student will be able to

- *Design circuits for DC and AC analysis with theorems.*
- *Predetermine performance of DC machine.*
- *Determine performance of DC machines by direct tests.*
- *Develop programs for circuit analysis using PSpice.*

List of Experiments in the Lab:

1. a) Verification of Kirchoff's Laws.
   b) Parameters of a given Choke Coil.
2. Verification of Thevenin's Theorem.
3. Verification of Superposition Theorem.
4. Verification of Maximum power transfer theorem and reciprocity theorem.
5. Locus diagrams of RL, RC and RLC circuits.
6. Open circuit characteristics of separately excited / self excited D.C shunt generator.
7. Load test on D.C Shunt Generator.
8. Load test on D.C Compound Generator.

9. Load test on D.C series generator.
10. Swinburne's Test.
11. Speed control of DC shunt motor.
12. Brake test on D.C Shunt Motor.
13. Hopkinson's test on D.C Machines.
14. Retardation test on D.C. Machine.
15. Simulation of RLC circuits using PS*pice.*
    i) Steady state analysis ii) Transient analysis
16. Verification of Thevenin's and Norton's theorems using PS*pice.*
17. Verification of Maximum power transfer theorem and superposition theorem using PS*pice.*

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

TEXT BOOKS :

1. *Electric Machines by I.J. Nagrath& D.P. Kothari, Tata McGraw - Hill Publishers.*
2. *Electro mechanics - I (D.C. Machines) S. Kamakshaiah Right Publishers.*
3. *Theory & performance of Electric Machines, by J. B. Gupta, S.K. Kataria& Sons.*

WEB REFERENCES:

1. *www.gtbit.org/downloads/emecsem3/emecsem3lmannual.pdf*
2. *www.centennialcollege.ca/Programs/Documents/.../ECME-123.pdf*
3. *www.iitk.ac.in/ee/labs/CSL/support_files/EE380_labmanual.pdf*
4. *www.bcit.ca/study/courses/elex7240*

II/IV Year B.Tech.- Third Semester

EE - 252 ELECTRONIC DEVICES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *To introduce analog electronic components to obtain the characteristics of diode, BJT,UJT,FET .*
- *To introduce digital electronic components to realize various gates , to design flip flops, code converters and combinational circuits.*

Learning outcomes:

With a Sufficient practical and problem solving background the student will be able to.

- *Analyze various electronic circuits like transistors and diodes by plotting the graphs basing on their characteristics.*
- *Design and verify the self-bias circuit in CE configuration.*
- *Assess various gates using universal building block (NAND gate).*
- *Design flip flops, code converter and combinational circuits using different gates.*

List of Experiments

1. Characteristics of PN Junction and Zener diode.
2. Characteristics of Transistor in Common Emitter configuration.
3. Verification of Transistor Self Bias Circuit.
4. Characteristics of Junction Field Effect Transistor.
5. Characteristics of Uni junction Transistor.
6. Characteristics of Silicon Controlled Rectifier.
7. Study of Half wave rectifier with and without filters.
8. Study of Full wave rectifier with and without filters.
9. Realization of Gates using Discrete Components.
10. Realization of Gates using Universal Building Block.
11. Design of Combinational Logic Circuits like Half-adder, Half-subtractor, Full-adder and Full-subtractor.

12. Design of Code converters.
13. Design of Multiplexers & Decoders.
14. Verification of Truth Tables of Flip Flops using Gates.
15. Design of Shift Register, Ring Counter and Johnson Counter using Flip Flops.
16. Design of Asynchronous counter- Mod counter, Up counter, Down counter and Up/Down counter using Flip Flops.
17. Design of Synchronous Counter- Mod Counter, Up counter, Down counter and Up/Down counter using Flip Flops.
18. Design of Sequence Generators using shift Registers and Multiplexers.

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. *N N Bhargava, D C Kulshreshtha, S C Gupta, Basic Electronics and Linear Circuits, Tata McGraw-Hill Edition, 2008.*
2. *M Morris Mano, Digital Logic and Computer Design, PHI/Pearson Education, 2003.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for University Examinations

II/IV Year B.Tech.-Third Semester

EE/EC - 253 COMMUNICATION SKILLS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To incorporate creativity and innovative thinking in problem solving.*
- *Students will be trained to acquire conclusions using well structured and logical reasoning.*
- *To select and apply appropriate qualitative and/or quantitative analytical methods and to identify reasonable alternatives.*
- *To develop a reasonable line of argument by using valid and reliable evidence, avoiding appeals to the emotions.*
- *To bring about an understanding of the importance of interpersonal skills in both professional and personal lives.*
- *To extend their abilities to listen effectively in a variety of situations for a variety of purposes.*
- *To extend their abilities to: read fluently and confidently a variety of texts for a variety of purposes.*
- *Train the students to make inferences from information in a sentence or paragraph, cause and effect logic, functional concepts and context clues.*

Learning outcomes:

- *Arrive at objective, well-reasoned decisions in reasonable time.*
- *Understand creativity and blocks to creativity.*
- *The student holds a particular value or belief that now exerts influence on his/her behaviour so that it becomes a characteristic.*
- *Comprehend and use language with accuracy, clarity, and discernment.*
- *Students focus on assignments using processes that apply content rather than on lectures and simply acquiring content.*
- *Students express ideas in a non-judgmental environment which encourages synthesis and creative applications.*
- *Problem-solving exercises nurture students' cognitive abilities.*

- *Students will understand and measure the impact deriving from their analysis by knowing their limitations.*

COURSE CONTENT :

UNIT-I

Analytical thinking

- ❍ Emotional intelligence, emotional quotient, cognitive skills, analysis and logical thinking, creative thinking and lateral thinking.
- ❍ Managing anger, failures, and disappointments.
- ❍ Positive approach.

UNIT-II

Behavioural Skills

- ❍ Attitude, self esteem, time management.
- ❍ Punctuality, confidence, integrity.
- ❍ Role plays.
- ❍ Mock press.

UNIT-III

- ❍ Listening Skills - Effective listening
- ❍ News paper reading - Reading aloud

UNIT-IV

- ❍ Group discussions - Do's and Don'ts, modulation of voice.
- ❍ Case studies.

LEARNING RESOURCES

TEXT BOOKS:

1. *Listening skills - Shrinky Slicy.*
2. *Call centre Stories - Case Studies.*

REFERENCE BOOKS:

1. *Kevin Gallagher, Skills Development for Business and Management Students.1st edition, Oxford university press. 2010.*
2. *Daniel Goleman, Working with Emotional Intelligence (1998) Bantam Books*
3. *Hari Mohan Prasad & Rajnish Mohan, How to prepare for Group Discussions and Interview, 2ndedition, TMT.*

WEB REFERENCES :

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

II/IV Year B.Tech.- Fourth Semester

EE/EC-221 ENGINEERING MATHEMATICS - IV

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- The aim of this course is to introduce students to the algebra and geometry of complex numbers and to the calculus of functions of a complex variable. The emphasis will be on gaining a geometric understanding of complex analytic functions as well as developing computational skills in employing the powerful tools of complex analysis for solving theoretical and applied problems.
- The main objective of this course is to introduce the under graduate students to complex analysis because technology we rely on requires scientists and engineers to understand this topic. Complex analysis are widely used in the fields of science and technology.
- In the solution of a great many types of problems in mathematics, we are led to the solution of differential equation. In the manipulation of function a number of helpful identities are used and hence a section is for presenting some important identities. An equal importance is given Legendre equation that occurs in the process of obtaining solutions of Laplace equation in spherical coordinates and hence is of great important mathematical applications to physics and engineering.
- To develop skills for applying them in future on various engineering applications.

Learning outcomes:

On completion of this course, students will be able to :

- Determine the analytic function and can find the harmonic conjugate.
- Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electro-magnetic fields.
- Find singularities of complex functions and determine the values of integrals using residues.
- Solve differential equations in series.
- Solve physical problems using Bessel's and Legendre's functions.

COURSE CONTENT :

UNIT-I [Text Book - 1]

Complex Analysis: Introduction, Continuity, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Orthogonal systems. (12)

UNIT-II [Text Book - 1]

Complex Integration: Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, Zeros and singularities. (13)

UNIT-III [Text Book - 1]

Calculation of residues, Evaluation of real definite integrals (by applying the residue theorem) Series solutions of differential equations: Introduction, Series solution, Validity of Series solution, General method (Frobenius method), Forms of series solution. (18)

UNIT-IV [Text Book - 1]

Series solution of Bessel's and Legendre's equation. Recurrence formulae, Generating functions, Rodrigue's formula, Orthogonality of Bessel's functions and Legendre polynomials (20)

LEARNING RESOURCES:

TEXT BOOK:

1. *Higher Engineering Mathematics, 40th Edition, 2007- B S Grewal, Khanna Publishers.*

REFERENCE BOOK:

1. *Advanced Engineering Mathematics, 8th Edition, - Erwin Kreyszig, New Age International (P) Ltd, 2007.*

WEB REFERENCES:

1. *http://freevideolectures.com/Subject/Mathematics*
2. *www.neptel.iitm.ac.in*

II/IV Year B.Tech.- Fourth Semester

EE/EC-222 DATA STRUCTURES

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives :

- *Familiarize the student with good programming design methods; particularly Top-Down design, to solve all sorts of complicated problems.*
- *Develop algorithms for manipulating stacks, queues, linked lists, trees, and graphs, Hashing Techniques, searching and sorting.*
- *Develop the data structures for implementing the above algorithms.*
- *Develop recursive algorithms as they apply to trees and graphs.*
- *Familiarize the student with the issues of Time complexity and examine various algorithms from this perspective.*
- *Familiarize the student with the concepts and help in mastering their applications in real software projects.*

Learning Outcomes :

- *Ability to write well-structured complex programs using the Concepts of data structures.*
- *Ability to implement and analyze different sorting algorithms like Bubble, Insertion, Selection, and Quick, Merge, Shell and Heap sorting.*
- *Ability to understand and implement the List Abstract Data Type (ADT) using both array based and linked-list based data structures, including single, double and circular linked-lists and its applications.*
- *Ability to understand and implement the Stack ADT using both array based and linked-list based data structures and also implement Stack applications;*
- *Ability to understand and implement the Queue ADT and Circular Queue ADT using both array based and linked-list based Data structures.*
- *Ability to understand and implement binary tree ADT using linked list based data structures*
- *Ability to understand and implement AVL tree operations and implement graph traversal techniques*

- *Ability to understand and implement different hashing techniques like separate chaining and open addressing.*

COURSE CONTENT :

UNIT - I Algorithm Analysis: (18)

Mathematical Back Ground, Model, What to Analyze, RunningTime Calculations.

Lists: Abstract Data Types, the List ADT, Singly Linked List ADT, Doubly Linked ListADT, Circular Linked List ADT, Polynomial ADT.

UNIT - II STACKS (17)

The Stack ADT Implementations using Arrays and linked list, Stack applications such as Infix to postfix expression conversion, Evaluation of Postfix expressions, Delimiter Matching.

QUEUES : The Queue ADT Implementations using Arrays and linked list, the CircularQueue ADT

UNIT - III SEARCHING (15)

Linear and Binary Searching, Hashing - Hash functions, Separate chaining, Open-Addressing.

Internal Sorting: Preliminaries, Bubble sort, Selection sort, Insertion Sort, Shell Sort Merge Sort, Quick Sort, Comparison of Sorting in terms of Time Complexities.

UNIT - IV (15)

Trees : Preliminaries-Binary Trees- Expression trees,Binary tree traversals,The Search tree ADT-Binary Search trees, implementation, Heap-Building Heap,Heap Sorting,AVL trees-Single Rotations,Double Rotations.

Graphs : Definitions,representations,graph traversals.

LEARNING RESOURCES:

TEXT BOOK:

1. *Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education.*

REFERENCE BOOKS:

1. *Y.Langsam,M.J.Augeustein and A.M.Tenenbaum, "Data Structures Using C",Pearson Education Asia,2004.*
2. *Horowitz and Sahani,"Fundamentals of Data Structures".*
3. *Samantha, "Classical Data Structures",PHI.*
4. *Trembly and Sorenson,"An Introduction of Data Structures with Applications".*

WEB REFERENCES:

1. *www.cs.sunysb.edu/~skiena/214/lectures/*
2. *en.wikibooks.org/wiki/Data_Structures.*
3. *courses.cs.vt.edu/csonline/DataStructures/Lessons/index.html*
4. *freevideolectures.com › Computer Science › IIT Delhi*
5. www.wiziq.com/tutorials/data-structure

II/IV Year B.Tech.- Fourth Semester

EE -223 ELECTRONIC CIRCUITS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To know the use of diode in clipping and clamping circuits.*
- *To understand the concepts of wave shaping and to design various circuits for any application.*
- *Model transistor in different modes and utilize it in the analysis and design of transistor circuits.*
- *To get an exposure about various transistor configurations and analysis of FET amplifiers, to have an idea about the frequency response of amplifiers.*

Learning outcomes:

- *To apply the fundamental concepts of wave shaping for various switching and signal generating circuits.*
- *To enable the students to have a fair knowledge about the transistors and amplifiers.*
- *Design and analyze the DC bias circuitry of BJT and FET.*
- *Design circuits using the transistors and diodes.*
- *Develop familiarity with the input resistance, appropriate gain parameter, and output resistance for all single-stage amplifier building blocks and their use in analyzing small-signal amplifiers.*

COURSE CONTENT :

UNIT - I [Text Book- 2]

Linear Wave Shaping: Response of RC high pass filter and low pass filter to step, pulse, ramp, exponential and sinusoidal inputs.

Non-Linear Wave Shaping: Clipping circuits with diodes, multi diode circuits, transient and steady state response of a diode clamping circuit, the clamping theorem, practical clamping circuits. (18)

UNIT - II [Text Book- 1]

Transistor Amplifiers : Small signal low frequency model for transistor,

analysis of transistor amplifiers using h-parameters, single and two stage transistor amplifier circuit at low frequencies, high input resistance transistor circuits, cascade transistor configuration, Emitter coupled difference amplifier, Millers theorem. (10)

Unit-III [Text Book- 1]

Transistor at High Frequencies: BJT at high frequencies, Hybrid PI model, CE short circuit current gain with resistive load, single stage CE transistor amplifier response, Emitter follower at high frequencies, gain bandwidth product. (10)

Unit-IV [Text Book- 1]

Multistage Amplifiers : Band pass of cascaded stages, high frequency response of two cascaded stages, CE-CE, CE-CB cascade amplifiers, effect of coupling and bypass capacitors.

FET Amplifiers: FET Amplifiers at low frequencies, CS/CD/CG configurations at low frequencies, FET amplifier at high frequencies - CS/CD amplifiers. (13)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Electronic Devices and Circuits by Millman & Halkias TMH, 2002.*
2. *Pulse, Digital and Switching Waveforms J. Millman and H. Taub, McGraw-Hill, 2nd edition 2007.*
3. *Integrated Electronics by Millman and Halkias, TMH.*

REFERENCE BOOKS:

1. *Electronic Circuits by D.L. Schilling and Belove.*
2. *Electronic Devices and circuits by Robert Boylestad and Lonis Nahalsky.*
3. *Electronic Devices and circuits by Bogart.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/video.php?subjectId=117106087*
2. *http://nptel.iitm.ac.in/video.php?subjectId=117103063*
3. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/esc102/node18.html*
4. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/esc102/node22.html*

II/IV Year B.Tech.- Fourth Semester

EE - 224 NETWORK ANALYSIS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To introduce AC three phase power measurement techniques.*
- *To calculate network functions, two port network parameters.*
- *To analyse transformed networks, coupled circuits.*
- *To design filter circuits.*
- *To synthesize networks and to know the difference between analysis & synthesis.*

Learning outcomes:

- *Able to calculate the power in 3-phase circuits.*
- *Connect the use of Laplace transforms and apply them in this subject which already studied in mathematics.*
- *They are able to attempt the some objective questions in written tests.*
- *Pursue courses like power systems and control systems.*
- *They gain knowledge about coupled circuits, filters, network synthesis and their applications.*

COURSE CONTENT :

UNIT - I [Text book-3]

Poly phase systems: Advantages of 3-phase systems - generation of 3-phase voltages - phase sequence - star & delta connections - interconnection of 3-phase sources and loads - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuit - measurement of 3-phase power- 2 wattmeter method. Analysis of 3-phase unbalanced systems - star / delta transformation method - application of KVL and Millman's method. (15)

UNIT-II [Text book-2,Text book-1,Text book-4]

Transformed Network Analysis: Response of RL, RC, RLC circuits for impulse and pulse excitations using Laplace Transform method.

Definition of operational/ transformed impedances and admittances of L,

C and transformer with initial conditions; development of transformed networks incorporating initial conditions as sources and solution of transformed networks; network functions for the Two-Port bridged - T, Ladder and Lattice networks.

Network Functions: Poles and Zeros - Network functions for the one port and two port - Poles and Zeros of network functions - Restrictions on pole and zero locations for driving point functions and transfer functions - Time domain behavior from the pole zero plot. (16)

UNIT -III [Text book-1,Reference book-2,Text book-4]

Two port networks : Open circuit impedance and short circuit admittance parameters, transmission (ABCD) and inverse transmission parameters, hybrid and inverse hybrid parameters, interrelation between them, image parameters, inter connection of 2-port networks.

Fourier Series: Trigonometric and exponential Fourier series, representation of periodic function by Fourier series, Fourier transforms of simple functions, Applications to circuit analysis. (15)

UNIT - IV [Text book-3,Reference book-2]

Coupled circuits: Defining self and mutual inductance, coefficient of coupling, dot convention, development of circuit equations in time domain and frequency domain, solution of coupled circuits, series and parallel connections of two coupled coils, tuned circuit analysis (single and double tuned)

Filters: Low pass, high pass & band pass filters - frequency response, constant K - and M filters.

Network Synthesis : Hurwitz polynomial - properties of positive real functions - sturm's test - Synthesis of RC, RL & LC driving point impedances and RL, RC admittances - CAUER and FOSTER methods of Synthesis. (28)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Engineering circuit analysis byW.H.Hayt&J.E.Kimmerly, 6th Edition,TMH, 2002.*
2. *Network analysis by M.E. Vanvalkenberg, 3rd Edition, 2006, Pearson Education.*
3. *Circuits and Networks: Analysis and synthesis by A.Sudhakar and*

Shyammohan, 3rd Edition, TMH, 2006.

4. *Circuits and Networks: Analysis, design and synthesis by M.S.Sukhija and T.K.Nagsarkar, Oxford press, 2010.*

REFERENCE BOOKS:

1. *Electric Circuits by Edminister, Schaum's series .*
2. *Network analysis and synthesis by F.F. Kuo.*
3. *Basic circuit analysis by Cunningham & J.A. Stuller.*
4. *Theory and problems of Electric Networks by B.R. Gupta.*

WEB REFERENCES:

1. *project.mvps.org/networkanalysis.htm % Applications of NA.*
2. *books.google.com/books/about/Network_Analysis.html?id=17IP... % References.*
3. *www.allaboutcircuits.com › ... › DC NETWORK ANALYSIS % DC network analysis*
4. *www.microimages.com/documentation/Tutorials/network.pdf % Network analysis tutorials*
5. *www.robcross.org/network_tutorials.htm % Network analysis tutorials*

II/IV Year B.Tech.- Fourth Semester

EE- 225 MECHANICAL TECHNOLOGY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course *Objectives:*

- *To provide sufficient theoretical and analytical background to understand the concepts of various equipments used in Thermal Plants*
- *To make the student learn the mathematical approach for design of some mechanical equipment.*
- *To develop skills for applying in future for various engineering applications.*
- *To teach the working of power plant equipment.*

Learning Outcomes:

- *Understand the concepts of mechanical elements in Thermal and Hydro-electric power plants.*
- *Connect the course content to real time applications in various electrical power engineering applications.*
- *Enhance the knowledge of working of machines in repair Workshops in power plants.*
- *The student acquires the knowledge about basic manufacturing processes.*
- *The student acquires the knowledge about belt and gear drives for power transmission.*
- *They can have clear idea about the working of power plants, refrigeration, air conditioning and IC engines.*

COURSE CONTENT :

UNIT-I [Text book-1]

Trasmission of Power by Belt Drive: Function of Belt drive, velocity ratios, slip in belts, ratio of tensions in a belt, length of belt- Open, Crossed & Compound, maximum power transmitted by belt drive.

Trasmission of Power by Gear Drive: Types of Gears, nomenclature of gears, Gear trains- Involutes, Spiral and Bevel, Gear reducers.

Prime Movers : Working of Babcock-Wilcox water tube boiler, principle and operation of Impulse and Reaction Steam Turbines, Working and comparison of 2-stroke and 4-stroke Petrol and Diesel engines. (15)

UNIT-II [Text book-1]

Pumps : Classification, Reciprocating and Rotary (Centrifugal and Axial flow types) pumps-working and constructional details, characteristics of pumps.

Impact of Jets : Force of a jet impinging normally on a fixed plate, inclined plate and a series of moving vanes; jet impact on Fixed Curved vane, Moving Curved vane.

Hydraulic Turbines: Classification, construction and working of Pelton wheel turbine, Francis turbine and Kaplan turbine, comparison among these turbines. (14)

UNIT-III [Text book-3]

Refrigeration Systems: Need for refrigeration, types, Bell-Coleman air refrigeration, vapor compression refrigeration - Modification, COP - Components on refrigerators.

Air conditioning Systems: Need for control of environment, psychrometric processes, summer and winter air conditioning systems - components - Heat load for computer centre, seminar hall. (12)

UNIT-IV [Text book-2]

Machine Tools : (Simple treatment only)

Lathe - Constructional details, specifications, working and operations.

Milling Machine- Constructional details, specifications, working and operations.

Drilling Machine- Constructional details, specifications, working and operations. (9)

LEARNING RESOURCES:

TEXT BOOKS :

1. *Elements of Mechanical Engineering by Mathur,Mehta & Tewari, 13/E, Dhanpat Rai & Sons.*
2. *Workshop Technology Vol. I and II, by Hazra Chowdary., S.K. and Bose., 11/E Media Promoters and Publishers Pvt. Ltd.*

3. *Refrigeration & Air-Conditioning- Arora & Domkundwar, Dhanpat Rai & Co. Pvt. Ltd.*

REFERENCE BOOKS:

1. *A Textbook of Mechanical Technology by R.S. Kurmi.*
2. *Basic Mechanical Engineering by T.S. Rajan, Wiley Eastern Ltd.*
3. *Workshop Technology, Vol. 1, 2 by W.A.J. Chapman, 4/E.*

WEB REFERENCES

1. *http://www.efunda.com*
2. *www.howstuffworks.com*
3. *http://www.youtube.com*
4. *http://nptel.iitm.ac.in*

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II/IV Year B.Tech.- Fourth Semester

EE - 226 AC MACHINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To get the student an idea of transformer and auto transformer*
- *To make the student to gain the knowledge of various types of transformers with their applications.*
- *To get the knowledge of poly phase induction motors.*
- *To make the student to understand the types of starting methods and speed control of induction motors.*
- *To make the student to understand the single phase induction motors, their characteristics and applications.*

Learning Outcomes:

- *Get an idea of transformer and their applications.*
- *Solve the problems related to transformer.*
- *Get the knowledge of different types of losses and testing of transformer.*
- *Gain the knowledge ofdifferent type of connections for the transformer.*
- *Gain the knowledge ofthree phase to two phase conversion.*
- *Get the knowledge of Parallel operation of transformer and its load sharing.*
- *Get the complete idea on poly phase induction motors.*
- *Get the idea on starters and speed control of induction motors and their applications.*
- *Get the idea on induction generator and the applications.*
- *Get the knowledge of single phase induction motors and their characteristics and their applications*
- *Get the knowledge on circle diagram in detail.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Transformers: Constructional features of transformers - EMF equation - no load and load phasor diagram - equivalent circuit of single phase transformers. Regulation - losses - efficiency and all day efficiency .Testing of transformers: OC & SC tests - Sumpner's test etc. (18)

UNIT - II (Text Book- 2)

Auto transformers - Tertiary transformer winding - 3 phase transformer windings and its connections. Open delta - Scott connected transformers - 3 phase to 2 phase conversion. Parallel operation of transformer and its load sharing. Tap changing - methods of cooling. (11)

UNIT - III (Text Book- 3)

Poly Phase Induction Motors: Rotating magnetic field in two phase & three phase systems - construction and operation of squirrel cage and slip ring 3-phase induction motors - torque equation and torque slip characteristics - equivalent circuit - Power losses - efficiency - testing of induction motors and circle diagrams. (14)

UNIT - IV (Text Book-4)

Types of starters - speed control of induction motors - Crawling and Cogging - Double cage rotors - Induction generators and their applications.

Single Phase Induction Motors: Double field revolving theory - starting methods Split phase - capacitor start and run -shaded pole motors - characteristics and their applications - equivalent Circuit. (17)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition.*
2. *Electric Machines by I.J. Nagrath&D.P.Kothari,TataMcGraw Hill, 7th Edition.2005.*
3. *Principles of Electrical machines and power electronics by P.C. Sen John Wiley & Sons 2003.*

4. Electrical machines by S.K.Battacharya, TataMcGraw Hill, 3rd edition.

REFERENCE BOOKS:

1. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies,2nd edition.

2. Alternating Machines by A.F. Puchston, AG. Contraod& Lloyd.

3. Electrical Machinery & Transformers by Irving L. Kosow, PHI.

4. Theory of performance of electrical machines by J.B. Gupta, S.K. Khataria& Son's Publications.

5. Performance & Design of AC Machines by M.G. Say BPB Publishers.

WEB REFERENCES:

1. *www.electrical4u.com/electrical-transformer/three-phase-transformer.php % reference for single phase & three transformers*
2. *www.hammondpowersolutions.com/products/locate_by_product/autotransformers/index.php % reference for autotransformers*
3. *www.electrotechnik.net/2006/08/in-autotransformer-primary-and.html% for autotransformers*
4. *www.allaboutcircuits.com/vol_2/chpt_13/7.html % poly phase induction motors*
5. *www.youtube.com/watch?v=K3jUTnhzA-Q% speed control of induction motor*
6. *www.lmphotonics.com/m_start.html% for types of starters on induction motors*
7. *www.vias.org/kimberlyee/ee_20_12.html% reference for circle diagram*

II/IV Year B.Tech.- Fourth Semester

EE - 261 AC MACHINES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

The main objectives of this lab course are

- *To design experimental setup for calculating two port network parameters.*
- *To design experiments to study the performance and operation of transformers.*
- *To develop experimental setups for studying the performance and operation of squirrel cage and slip ring induction motors.*
- *To perform Direct and Indirect tests, separation of losses.*
- *To separate the losses of an Induction motor.*

Learning Outcomes:

After completion of this lab course, the student able to .

- *To understand the testing of transformers.*
- *To operate the transformers in parallel.*
- *In industries when 2-phase is required like furnaces by using Scott connection.*
- *Analyzing the performance characteristics of Induction motors.*
- *Draw the equivalent circuits of the transformers and Induction motors*
- *Asses the performance of the given transformers and Induction motors*

List of Experiments:

1. Determination of Z, Y parameters of a given two port network.
2. OC & SC tests on single - phase transformer.
3. Load test on single - phase transformer.
4. Sumpner's test on Transformers.
5. Scott Connection of Transformers.
6. Parallel Operation of Two Single - Phase Transformers.
7. Load test on 3 - phase squirrel cage induction motor.

8. Load test on 3 - phase slip ring induction motor.
9. No load and Blocked rotor test on 3 - phase induction motor.
10. Brake test on single - phase induction motor.
11. Determination of Equivalent Circuit of Single - Phase Induction Motor
12. Parallel operation of 3 - phase transformers.
13. Harmonic analysis of transformer.
14. Separation of losses of 3-phase Induction motor .

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES :

REFERENCE BOOKS:

1. *Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition.*
2. *Electric Machines by I.J. Nagrath& D.P. Kothari, Tata McGraw - Hill Publishers*
3. *Electrical Machines by SamarjitGhosh, Pearson 2nd edition, 2008.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

II/IV Year B.Tech.- Fourth Semester

EE/EC - 262 DATA STRUCTURES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

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

- *Assess how the choice of data structures and algorithm design methods impacts the performance of programs.*
- *Choose the appropriate data structure and algorithm design method for a specified application.*
- *Write programs using procedure-oriented design principles.*
- *Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.*
- *Principles for good program design, especially the uses of data abstraction and modular program composition.*

Learning Outcomes :

Be able to write well-structured procedure-oriented programs of up to 1000 lines of code.

- *Understand Big-O notation and apply it to simple methods, including methods that utilize complex loops and recursion.*
- *Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and Quick sort.*
- *Understand and implement the List Abstract Data Type (ADT) using both array based and linked-list based data structures, including singly, doubly, and circular linked-lists.*
- *Understand and implement the Stack ADT using both array based and linked-list based data structures.*
- *Understand and implement the Queue ADT using both array based circular queue and linked-list based implementations.*
- *Understand and implement binary search trees.*
- *Understand and implement heaps using an array based tree data structure.*

- *Understand and implement hash table data structures.*
- *Be able to implement principles for good program design, especially the uses of data abstraction and modular program composition.*
- *Be able to assess how the choice of data structures and algorithm design methods impacts the performance of programs.*
- *Be able to choose the appropriate data structure and algorithm design method for a specified application.*

LIST OF EXPERIMENTS:

1. Programs to perform the following ADT operations on single linked list and Double linked list.
   a) Creation b) insert at begin
   c) insert at end d) insert after specified position
   e) deletion f) display
   g) search an element h) sorting the list
   i) reversing the list j) concatenation of two linked lists.
2. Linked list program.
3. Program to perform insertion and deletion operations on single circular linked list.
4. Program to perform polynomials addition and multiplication using linked lists.
5. Program that reads two lists of elements, prints them, reverses them, prints the reverse list, sort the lists, print the sorted lists, merge the list, print merge list.
6. Programs to implement stack using arrays and linked lists.
7. Programs to convert infix expression to postfix expression and evaluation of postfix expression.
8. Programs to implement Queues using arrays and linked list.
9. Program that reads postfix arithmetic expression, builds an Expression tree and perform tree traversals on it.
10. Program to construct Binary search tree and to perform the following operations.

a. Insertion
b. Deletion
c. Find_min
d. Find_max
e. Searching
f. Sorting

11. Programs to implement Hashing Techniques.
12. Implement the following searching and sorting techniques
    a. Binary search
    b. Shell Sort
    c. Heap Sort
    d. Merge Sort
    e. Quick Sort

II/IV Year B.Tech.- Fourth Semester

EE -263 MECHANICAL TECHNOLOGY LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 2*

Course Objectives

- *Student will able to find flash and fire points of a given fuel using Cleveland apparatus.*
- *Student will able to find the viscosity of lubricating oil using Saybolt viscometer.*
- *Student will able to find the Calorific value of a gaseous fuel using Junker's Gas Calorimeter.*
- *Student will able to do the Performance test on single cylinder, 4 - stroke petrol engine.*
- *Student will able to do the Performance test on single cylinder, 4 - stroke diesel engine.*
- *Student will able to make different patterns and mouldings for casting purpose.*
- *Student will able to do turning operation on a Lathe.*
- *Student will able to prepare a mould with different shapes and sizes of mouldings.*

LEARNING RESOURCES

- *Students know the importance of flash and fire point of fuel for storing and transporting the fuels.*
- *Students understand the importance of viscosity of lubricating oil. (cooling and reducing the friction between sliding parts)*
- *Students know the importance of calorific value of a gaseous fuels.*
- *Students know how mechanical efficiency and brake thermal efficiency changes with change of the load at constant speed. (both Petrol and Diesel engines)*
- *Student can implement techniques and methods for performing different lathe operations and producing different shapes of moldings.*

List of Experiments:

1. Flash and fire points of a fuel using Cleveland apparatus.
2. Viscosity of a lubricating oil using Saybolt viscometer.
3. Calorific value of a gaseous fuel using Junker's Gas Calorimeter.
4. Valve Timing Diagram of single cylinder four stroke diesel engine.
5. Port timing Diagram of Single cylinder two stroke petrol engine.
6. Performance test on single cylinder, 4 - stroke Diesel Engine using electrical Dynamometer.
7. Performance test on single cylinder, 4 - stroke Diesel Engine using Band-brake.
8. Performance test on Twin cylinder, 4 - stroke diesel engine.
9. Performance test on Air compressor.
10. Study of Boilers.
11. Moulding: Stepped Cone Pulley.
12. Moulding: Hand Wheel.
13. Turning: Tapper Turning.
14. Turning: Thread Cutting.

Note: Minimum of any ten experiments has to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Elements of Mechanical Engineering by Mathur,Mehta & Tewari, 13/E, Dhanpat Rai & Sons.*
2. *Workshop Technology Vol. I and II, by Hazra Chowdary., S.K. and Bose., 11/E Media Promoters and Publishers Pvt. Ltd.*
3. *Workshop Technology, Vol. 1, 2 by W.A.J. Chapman, 4/E.*
3. *Refrigeration & Air-Conditioning- Arora & Domkundwar, Dhanpat Rai & Co. Pvt. Ltd.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

III/IV Year B.Tech.- Fifth Semester

EE/EC -311 LINEAR CONTROL SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background to understand the concepts of continuous time linear control systems*
- *To make the student to learn the mathematical applications related to control systems*
- *To develop skills for applying them in future on various engineering applications*
- *To teach the analysis and design of feedback control systems*
- *To give an idea on state space analysis, modelling and analysis of linear control systems using state space representation*

Learning Outcomes :

- *Understand the concepts of continuous time linear control systems*
- *Assess the stability of feed back control system with classical approach*
- *Design simple control systems and modify the parameters to meet specific requirements*
- *Connect the course content to real time applications in various electrical and electronics engineering applications*
- *Pursue courses like advanced control systems, digital control systems*
- *Get solutions for problems related to control systems in competitive examinations.*

COURSE CONTENT :

UNIT - I [Text book-1,Text book-4,Reference book-1]

Introduction: Basic concept of simple control system - open loop - closed loop control systems. Effect of feed back on overall gain - stability sensitivity and external noise. Types of feed back control systems - Linear time invariant, time variant systems and non linear control systems

Mathematical models and Transfer functions of Physical systems: Differential equations - impulse response and transfer functions -

translational and rotational mechanical systems. Transfer functions and open loop and closed loop systems. Block diagram representation of control systems - block diagram algebra - signal flow graph - Mason's gain formula

Components of control systems: DC servo motor - AC servo motor - synchro transmitter & receiver (17)

UNIT - II [Text book-2 ,Text book-1,Reference book-2,Text book-4]

Time domain analysis: Standard test signals - step, ramp, parabolic and impulse response function - characteristic polynomial and characteristic equations of feed back systems - transient response of first order and second order systems to standard test signals. Time domain specifications - steady state response - steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width - dominant poles of transfer functions.

Stability analysis in the complex plane: Absolute, relative, conditional, bounded input -bounded output, zero input stability, conditions for stability, Routh -Hurwitz criterion. (16)

UNIT - III [Text Book-1, Reference Book-2]

Frequency domain analysis: Introduction - correlation between time and frequency responses - polar plots - Bode plots - Nyquist stability criterion - Nyquist plots. Assessment of relative stability using Nyquist criterion - closed loop frequency response. (10)

UNIT - IV [Reference Book -1,Text Book -3,Text book-1]

Root locus Technique: Introduction - construction of root loci Introduction to Compensation Techniques, P,PI,PID Techniques

State space analysis: Concepts of state, state variables and state models - diagonalisation - solution of state equations - state models for LTI systems. Concepts of controllability and Observability. (20)

LEARNING RESOURCES:

TEXT BOOKS:

1. *I.J.Nagrath& M Gopal, Control Systems Engineering, 3rd edition, New Age International.*
2. *K. Ogata, Modern Control Engineering, 3rd edition, PHI.*
3. *S.Hasan saeed, Automatic Control Systems, 6th Revised Edition, KATSON EDUCATIONAL SERIES.*

4. B.C. Kuo, Automatic control systems, 7th edition, PHI.

REFERENCE BOOKS:

1. *Schaum Series, Feedback and Control Systems, TMH.*
2. *A.K.Jairath, Problems & Solutions of Control Systems, 4th Edition, CBS Problems & Solutions Series.*
3. *M.Gopal, Control Systems Principles and Design, TMH.*

WEB REFERENCES:

1. *users.ece.utexas.edu/~buckman/Svars1.pdf % Reference for state space analysis*
2. *http://techteach.no/publications/control_system_toolbox/ % Reference for Matlab control system tool*
3. *http://csd.newcastle.edu.au/simulations/roll_sim.html % Reference for design problem*
4. *www.dprg.org/tutorials/2003-10a/motorcontrol.pdf % Control system design for robo application*

III/IV Year B.Tech.- Fifth Semester

EE/EC-312 OOPS AND OS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objective:

- *To demonstrate adeptness of object oriented programming in developing solutions to problems, demonstrating usage of data abstraction, encapsulation, and inheritance and skills to become a proficient C++ programmer.*
- *To provide the knowledge of fundamental concepts of C++ programming, including some of the more challenging aspects of pointers, arrays, Classes and objects, Inheritance, constructors and destructors.*
- *To Provide brief insight of operating system and its goals and services. Introduction to different kinds of Operating systems. Brief explanation of processes, threads, and schedulers, explanation of CPU scheduling.*
- *To expose the concepts of various Memory management techniques.*

Learning Outcomes :

- *Ability to demonstrate mastery of fundamental object-oriented programming techniques such as data abstraction, information hiding, encapsulation using C++, C++ syntax and semantics.*
- *Ability to perform object oriented programming to develop solutions to complex (real life) problems.*
- *Able to design and develop multi process , inter process applications and efficient scheduling algorithms.*
- *Able to design and develop effective resource sharing applications and applications to manage the storage space.*

COURSE CONTENT :

UNIT - I [Text Book - 1]

Principles Of Object Oriented Programming: Basic Concepts of Object Oriented Programming, Benefits of OOP, Object oriented Languages, Applications of OOP.

Beginning With C++,Tokens, Expressions And Control Structures: Introduction,Basic Data Types ,User defined data types, Derived data types, Symbolic constant , type compatibility, Declaration of variables, Dynamic Initialization of Variables, Reference variables, Operators in C++,Scope resolution operator, Memory management operator, Manipulators ,type casting operator. (13)

UNIT - II [Text Book - 1]

Introduction to functions in C++, The Main function, Function prototype, Call by reference, Return by reference, Inline Function, Default Arguments, Const Arguments, Function Overloading.

Introduction Classes And Objects, C structures Revisited, Specifying a class, Defining member functions, A C++ Program with Class, Making an outside function Inline, Nesting of Member Function, Private Member Functions, Arrays with in a Class, Array of objects, Memory allocation for objects, Objects as Function Arguments, Friendly functions, Returning Objects.

Constructors And Destructors :

Introduction,Constructors,Parameterized Constructors, Multiple Constructors in a class, Copy Constructor , Dynamic Constructor, Destructors. (17)

UNIT - III [Text Book - 2]

Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems , Clustered Systems ,Real-Time Systems, Handheld Systems Computer systems structures: Computer-System Operation, I/O Structure, Operating system structures: System Components, Operating-System Services, System Calls, System Programs, System Structure.

Process Management: Process: Process Concepts, Process Scheduling, Operation on Process, Co-operating Process, Inter Process Communication. (15)

UNIT - IV [Text Book - 2]

CPU Scheduling: Scheduling criteria, Scheduling algorithm, Multiprocessor scheduling, Real time scheduling, Algorithm evaluation. **Threads:** Overview Storage Management.

Memory Management: Back ground, Swapping, Contiguous Memory allocation, Paging, Segmentation, and Segmentation with Paging.

Virtual Memory: Background, Demand Paging, Page Replacement Algorithms, Allocation of Frames. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. *E Balaguruswamy , Object Oriented Programming with C++, 6th Edition, TMH, 2003.*
2. *Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, 2002.*

REFERENCE BOOKS:

1. *William Stallings, Operating Systems, 4th Edition, Pearson Education/PHI, 2003.*
2. *Timothy Budd, An Introduction to Object Oriented Programming, 2nd Edition, Pearson Education,2002.*

WEB REFERENCES:

1. *http://docs.oracle.com/javase/tutorial/java/concepts/*
2. *http://www.adobe.com/devnet/actionscript/learning/oop-concepts/inheritance.html*
3. *http://www.cs.wustl.edu/~schmidt/PDF/C++-basic-examples4.pdf*
4. *http://www.tutorialspoint.com/cplusplus/cpp_references.htm*
5. *http://studentscircle.net/live/2012/02/introduction-to-object-oriented-programming-using-c/*
6. *http://en.wikipedia.org/wiki/Operating_system*
7. *http://fcitr.kau.edu.sa/GetFile.aspx?id=60876&fn=Operating*
8. *http://iete-elan.ac.in/SolQP/soln/DC14_sol.pdf*
9. http://iete-elan.ac.in/SolQP/soln/DC14_sol.pdf

III/IV Year B.Tech.- Fifth Semester

EE-313 ELECTRONIC CIRCUIT ANALYSIS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To get exposure to various power amplifiers and feedback amplifiers.*
- *To have an idea about different types of tuned amplifiers and the frequency response of various oscillators.*
- *To have a clear understanding of the operation of multivibrators and regulated power supplies.*

Learning Outcomes:

- *Enable the students to have a fair knowledge about the power amplifiers, feedback amplifiers, oscillators, multivibrators, sweep circuits and regulated power supplies.*

COURSE CONTENT :

UNIT-I [Text Books 1&2]

Power Amplifiers: Class A large signal amplifiers, second harmonic distortion, transformer coupled audio power amplifiers - efficiency, class B push pull amplifiers - efficiency, class AB operation, Push-pull amplifiers without output transformer, phase inverter for push-pull input, Complementary-symmetry power amplifiers, design of coupled transformer, class A, Class B push pull amplifiers, Temperature considerations, DC amplifiers, chopper amplifiers. (15)

UNIT-II [Text Books 1&2]

Feed Back Amplifiers: Classification of amplifiers, Feedback concept, Negative feedback amplifiers and their characteristics, Different topologies, Stability in General.

Oscillators: Barkhausen Criterion, RC phase shift oscillator, Wein bridge, Hartley, Colpitts oscillators using transistors, Frequency stability, Crystal oscillators. (15)

UNIT-III [Text Books 1&2]

Tuned Amplifiers: Single tuned amplifier, tuned primary amplifier, Tuned secondary FET amplifier, Double tuned transformer amplifier, Class C amplifier examples.

Multivibrators (using BJT): The Bistable multivibrator, Schmitt trigger circuit, comparative study of Bistable, Monostable and Astable multivibrators. (15)

UNIT-IV [Text Book 2& Reference Book 2]

Regulated Power Supplies: Series and shunt regulators using discrete components, protection techniques, design of voltage regulators, switching mode power supplies (AC & DC), UPS.

Sweep Circuits: Voltage sweep circuits, current charging, voltage sweep circuits, current sweep circuits, need for a trapezoidal waveform for linearity correction, its generation and application. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. Integrated Electronics by Millman & Halkias TMH.

2. Electronic Circuits, Discrete and Integrated by Schilling and Belove TMH.

REFERENCE BOOKS:

1. *Electronic fundamentals and applications, Integrated and Discrete by John D. Ryder Prentice-Hall of India Private Ltd.*

2. *Pulse and digital circuits by Anand Kumar Prentice-Hall of India Private Ltd.*

WEB RESOURCES:

1. *www.neptel.iitm.ac.in*
2. *http://freevideolectures.com/Subject/Electronics*
3. *http://buildinggadgets.com/index_circuitlinks.htm*

III/IV Year B.Tech.- Fifth Semester

EE-314 GENERATION OF ELECTRICAL POWER

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

***Course Objectives**:*

- *To make the student to understand various types of electrical power generation in detail.*
- *To demonstrate steam, hydel and nuclear power plants.*
- *To understand the significance of non conventional energy resources, power generation using solar, wind, tidal, geo thermal and fuel cells.*
- *To know various factors associated with power plants, power plant economics & Tariff structure.*

Learning Outcomes:

After completion of this course, the student is expected to have

- *The ability to know various economical aspects while selecting a particular type of power station.*
- *Knowledge on different types of power stations with their components*
- *Concepts of Renewable energy conversion principles.*

COURSE CONTENT :

UNIT - I [Text Books 1&2]

Choice of power stations and units: Types of power stations - choice of generation - size of generator units - load duration curve - effect of variable load on plant operation and design.

Thermal power stations : Selection of site for thermal station - layout and salient features - boilers - economizers - condensers - coal handling - feed water treatment - steam turbines - turbo generators.

Hydroelectric Stations: Hydrology - hydrographs - mass curves - classification of hydroelectric plants - general arrangement and operation of hydroelectric plants and its function. (15)

UNIT - II [Text Books 1&2, Reference Book 2]

Nuclear Power Stations: Principles of nuclear power station - basic factors in designing of reactors - pressurized water reactor - boiling

water reactor - CANDU reactor - liquid metal cooled reactor - shielding and safety precautions.

Gas Turbine Plants: Layout of gas turbine plant - principle of operation - open cycle and closed cycle plants. Improvement of thermal efficiency of gas plant.

Combined cycle Plants: Introduction - stag combined cycle plant - combined cycle with nuclear gas turbine and fossil fuel fired steam turbine (15)

UNIT - III [Reference Book2]

Solar Energy: Basics of solar energy - solar constant - extra terrestrial radiation - types of conversion systems - solar thermal power plants - solar pond - solar cell.

Wind Energy: Principles of wind power - types - wind turbine operation, types of wind generators, Tidal energy-Geo thermal Energy - Fuel cells. (15)

UNIT - IV [Text Books 1&2]

Economical Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor - diversity factor - plant use factor - reduction of cost by inter connected stations. Power factor considerations - causes of low power factor - methods of improving power factor - phase advancing and generation of reactive KVAR - most economical power factor for constant KW load and constant KVA type loads.

Tariff : Characteristics of Tariff - types of Tariff. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Elements of Electrical power station design by M.V. Deshpande, Wheeler Publishing Co.*
2. *Generation of Electric Power by B.R. Gupta S. Chand & Company Ltd.*
3. *Non conventional energy sources by G. D. Rai Khanna Publishers,New Delhi*

4. *Generation distribution and utilization of electrical energy by C.L. Wadhwa, New Age International (P) Limited, 2005.*
5. *Renewable Energy Resources by John Twidell & Tony Weir, 2nd Edition, Taylor & Francis, 2007.*

REFERENCE BOOKS:

1. *Solar power Engineering by B.S.Magal TMH Publishing Company. Ltd., New Delhi.*
2. *Power plant Technology by M.M.el.Wakil, TMH Publishing Company. Ltd., New Delhi.*
3. *Electrical power systems theory and practice by M. N. Bandyopadhyay - PHI.*

WEB REFERENCES:

1. *www.neptel.iitm.ac.in*
2. *http://solarsystem.nasa.gov/features/planet/sun*
3. *www.microhydropower.net*

III/IV Year B.Tech.- Fifth Semester

EE -315 TRANSMISSION & DISTRIBUTION

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

Main objectives of this course are

- *To calculate transmission line parameters.*
- *To discuss the theory and mechanical design of transmission lines.*
- *To introduce various types of distribution systems.*
- *To explain rigorous theory on substation practice, different protective devices used in substations, transmission systems.*
- *To teach various design considerations and theory of underground cables.*

Learning Outcomes:

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

- *Understand the types of conductors used for electrical system and classification of transmission lines.*
- *Analyze the performance of short, medium and long transmission lines.*
- *Calculate the sag and tension of conductor.*
- *Identify the transmission system which require minimum volume of conductor materials.*
- *Classify the types of distribution system.*
- *Get solutions for problems inductance, capacitance , sag, copper losses and string efficiency.*

COURSE CONTENT :

UNIT - I [Text books-2&3]

Transmission line parameters: Expressions for inductance and capacitance of single phase and 3-phase lines of symmetrical and transposed configurations - concept of self GMD (GMR) and mutual GMD - double circuit lines and bundled conductors - effect of ground on capacitance - line charging KVAR calculations. Inductive interference.

(16)

UNIT - II [Text books-2&3]

Transmission line theory: Short, medium and long lines - regulation and efficiency - π, T and rigorous methods of solution - ABCD constants - sending and receiving end power angle equations and power circle diagrams. Surge impedance loading - Ferranti effect. (10)

Distribution: Comparison of copper efficiencies between DC , AC Single phase, 3-phase, 3-wire & 4-wire systems - calculation of voltage regulation in case of non-uniform and uniformly distributed loads on feeders - feeders fed at one end and both ends - ring feeders without and with interconnections. (6)

UNIT - III [Text books-2&3]

Travelling wave Phenomenon: Travelling waves on transmission lines, attenuation of travelling waves

Protection against traveling waves: Rod gaps - sphere gaps - different types of arrestors and surge absorbers.

Substation Practice: Classification of substations - indoor and outdoor substations - busbar arrangements - single busbar - sectionalized single busbar - main and transfer busbar system - sectionalized double busbar system - ring mains - group switching. Substation layout showing the location of PT's and CT's - lightening arrestors, earth switches, isolators, circuit breakers and auxiliaries. (13)

UNIT - IV [Text books-2&3]

Insulators: Types of insulators - voltage distribution in a string of suspension insulators.

Grading of insulators: Failure of insulator and testing, arcing horns.

Underground Cables: Types of cables - laying of cables - insulation resistance - electric stress and capacitance of single core cable - use of inter sheath - capacitance grading - capacitance of three core belted type cable - stress in a three core cable - sheath effects - currents in bonded sheaths - electrical equivalent of sheath circuit - thermal characteristics of cables. (16)

LEARNING RESOURCES:

TEXT BOOKS:

1) *Elements of Power system analysis by W.D. Stevenson TMH 4th Edition.*
2) *Electrical power systems by C.L. Wadhwa, New Age Intl. (P) Limited 3rd Edition.*
3) *Electric power transmission and distribution by Sivanagaraju and Satyanarayana, Pearson Education.*

REFERENCE BOOKS:

1) *Transmission and Distribution by H. Cotton B. I. Publishers, New Delhi, 1998*
2) *Electric Power Generation, Transmission & Distribution by S.N. Singh, PHI, 2003.*
3) *Modern power system analysis by D.P. Kothari & I.J. Nagrath McGraw Hill 3rdedition,2003.*

WEB REFERENCES:

1. *en.wikipedia.org/wiki/ Electric_power_...*
2. *www.gepower.com/prod_serv/plants_td/e...*
3. *www.tatapower.com.*
4. *http://nptel.iitm.ac.in*

III/IV Year B.Tech.- Fifth Semester

EE -316 SYNCHRONOUS & SPECIAL MACHINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 4*

Course Objectives:

- *To Provide students with strong foundation on the classification and construction of synchronous generators.*
- *To Provide students with solid foundation on the performance and testing of a synchronous generator.*
- *To Provide students with strong foundation on the model of two reaction method for a salient pole synchronous machine.*
- *To Provide students with strong foundation on the working of a 3-phase synchronous motor.*
- *To Provide students with strong foundation on the working of single phase motors.*

Learning outcomes:

- *Understands the specification of three phase Synchronous Generator and analyze simple but realistic problems.*
- *Understands the specifications of synchronous generators and are able to solve problems involving synchronous machines operating alone or in parallel.*
- *Comprehend theoretical knowledge and practical insights of synchronous machines, and its testing and are able to implement such tests, with minor additional direction, in a lab environment.*
- *Understands the principle of working, specifications, applications of universal motor and single phase ac series motor.*
- *Understands the principle of working, specifications, applications of reluctance motor and hysteresis motor. Understand the principle of working, specifications, applications of variable reluctance stepper motor, permanent magnet stepper motors and linear induction motor.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Synchronous Generators: Construction - e.m.f. equation with sinusoidal flux - winding factors - harmonics in generated voltage and their

suppression - armature reaction - synchronous impedance - vector diagram - load characteristics - methods of determining regulation - direct load - EMF, MMF, ZPF and ASA. (19)

UNIT - II [Text Book- 1 &2]

Blondel two reaction method for salient pole machine - phasor diagram - slip test - regulation of salient pole machines - parallel operation - synchronizing with infinite bus bars - synchronizing power - effect of variation of excitation and mechanical input on parallel operation - load sharing - losses and efficiency. (15)

UNIT - III [Text Book- 1&2]

Synchronous Motor: Theory of operation - starting methods - phasor diagrams - variation of current and power factor with excitation - minimum and maximum power for a given excitation and power circles - V and inverted V curves - hunting and its prevention - synchronous condenser and its applications. (17)

UNIT - IV [Text Book- 2]

Single Phase Series (Universal) motors: Principle of operation and characteristic of AC series motors - Repulsion motors and its applications.
Single phase Synchronous motors: Basic concepts and principle of operation and characteristics of reluctance motor and hysteresis motor
Stepper Motor: Variable reluctance stepper motor - permanent magnet stepper motor - principle of operation of linear induction motor and its applications. (9)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Electric Machinery by P.S. Bhimbra, Khanna Publications 7th edition.*
2. *Electric Machines - by I.J. Nagrath& D.P. Kothari, Tata McGraw-Hill Publishers, 3rd Edition 2004.*
3. *Generalized theory of Electric Machines by P.S. Bimbra Dhanpat Rai and sons, 2000.*

REFERENCE BOOKS:

1. *Alternating current Machines by A.F. Puchatein, T.C. Lloyd and A.G. ConaradAsia publishing house, 1962.*
2. *Theory of Alternating Current Machinery by Langsdorf, Tata McGraw-Hill, 2nd Edition.*
3. *Principles of Electrical machines and power electronics by P.C. Sen John Wiley & Sons 2003*

4. *Electric Machinery - by A.E. Fitzgerald, C.Kingsley and S.Umans, McGraw-Hill Companies, 6th edition, 2003.*

WEB REFERENCES:

1. *http://www.nptelvideos.com/electrical_engineering/*
2. *http://nptel.iitm.ac.in/*
3. *http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Roorkee/Electrical%20Machines%202%20%28Video%29.html*
4. *http://www.creativeworld9.com/2011/02/learn-electrical-machines-iii-through.html*

III/IV Year B.Tech.- Fifth Semester

EE -351 SYNCHRONOUS & SPECIAL MACHINES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objective:

To develop on hand experience with synchronous generators & motors and special motors by allowing them to conduct various experiments on synchronous machines and special machines.

Learning Outcomes:

The students will know to calculate the regulation of alternators by various methods, load sharing, floating of alternator, performance of synchronous and special motors, measurement of Xd& Xq parameters, excitation effect on synchronous motor etc.

List of Experiments:

1. Load test on alternator - for UPF, Inductive and Capacitive loads.
2. Regulation of alternator by synchronous impedance and MMF methods.
3. Regulation of alternator by ZPF & ASA methods
4. Synchronization of alternator with infinite bus - P and Q control.
5. Parallel operation of two synchronous machines.
6. V and inverted V curves of synchronous motor.
7. Synchronous motor performance with constant excitation.
8. Separation of losses in single- transformer by V/F method.
9. Measurement of Xdand Xq of a three phase alternator by slip test
10. Load test on Universal motor.
11. Measurement of Xd" and Xq" of a three phase alternator.
12. Load test on 1- synchronous reluctance motor.
13. Power factor correction using synchronous motor.
14. Load test on synchronous hysteresis motor.
15. Load test on 1- repulsion motor.

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. *Electric Machines - by I.J. Nagrath& D.P. Kothari, Tata McGraw-Hill Publishers, 3rd Edition 2004.*
2. *Generalized theory of Electric Machines by P.S. Bimbra Dhanpat Rai and sons, 2000*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

III/IV Year B.Tech.- Fifth Semester

EE -352 ELECTRONIC CIRCUITS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 2*

Course Objectives:

- *To inculcate strong practical training on the design of wave shaping circuits, multivibrators and sweep circuits.*
- *To Analyze and Design the Power and Tuned amplifiers.*

Learning Outcomes:

The students will be able to design and analyze

- *Linear and Non-Linear Wave shaping Circuits.*
- *Power amplifiers and Oscillators.*
- *Multi-vibrator circuits and Sweep circuits.*

LIST OF EXPERIMENTS:

1. Two stage RC coupled Amplifier
2. Design of voltage shunt feedback amplifier and determination of voltage gain, input impedance and output impedance with and without feedback
3. Class B push pull amplifier
4. Complementary symmetry amplifier
5. Design of RC phase shift oscillator
6. Design of LC oscillator
7. Design of series voltage regulator
8. Linear wave shaping
9. Non-linear wave shaping
10. Bistable multivibrator
11. Monostable multivibrator
12. Astable multivibrator

13. Schmitt trigger.

14. UJT relaxation oscillator.

15. Blocking oscillator.

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. Integrated Electronics by Millman & Halkias TMH.
2. Pulse and digital circuits by Anand Kumar Prentice-Hall of India Private Ltd.

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

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III/IV Year B.Tech.- Fifth Semester

EE-353 CONTROL SYSTEMS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

To make the student

- *To know the significance of P,PI,PID controllers used in design of control system.*
- *To understand the operating characteristics of servo motors, position control system.*
- *To check the frequency response of first and second order systems.*

Learning Outcomes:

At the end of EE-353- Control Systems lab, the students should attain an

- *Ability to design a linear control system to meet required specifications.*
- *Ability to check frequency responses of higher order systems in addition to first and second order.*
- *Ability to operate servo motors and synchros used for various applications in industry.*
- *Ability to use control systems tool box in MATLAB.*

List of Experiments:

1. Time response of second order systems.
2. Characteristics of synchros.
3. Effect of feedback on D.C servomotor.
4. Transfer function of D.C motor.
5. Effect of P, PD, PID controller on a second order system.
6. Simulation of transfer functions using operational amplifier.
7. Lag and lead compensation - Magnitude and phase plot.
8. Transfer function of D.C generator.
9. Temperature controller using PID.
10. Characteristics of magnetic amplifier.
11. Characteristics of A.C servo motor.

12. Stepper motor control.
13. D.C. position control.
14. P, PI, PD, PID control using Op-Amps.
15. Frequency response of first and second order systems.

Note: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. *Control systems Engineering by I.J.Nagrath & M.Gopal, New Age publisher, 5/E.*
2. *Control systems by A. Ananda Kumar, PHI.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

III/IV Year B.Tech.- Sixth Semester

EE/EC -321 LINEAR ICs AND APPLICATIONS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *To enable the students to understand the fundamentals of integrated circuits and designing electronic circuits using it*

Learning Outcomes :

- *Ability to understand the basics of linear integrated circuits and operational amplifiers with applications.*
- *Ability to design simple filter circuits for particular application*
- *Ability to understand analog to digital converters (ADC), and digital to analog converters (DAC)*
- *Ability to gain knowledge in designing a stable voltage regulator and understands the applications of PLL and special ICs.*

COURSE CONTENT :

UNIT - I [Text Book-1,2]

OPERATIONAL AMPLIFIERS: Introduction to differential amplifiers using BJT's, Operational amplifier block diagram representation and ideal characteristics, its equivalent circuit & transfer characteristics, op-amp with negative feedback. Representation & analysis of voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier with one op-amp, input offset voltage, input bias current, input offset current, total output offset voltage, frequency response of op-amp, stability, slew rate.

COMPARATORS: Introduction to comparator, Basic comparator, Zero-crossing detector, Schmitt Trigger, Comparator characteristics, Limitations of Op-Amps as comparators, Voltage limiters. (18)

UNIT - II [Text Book-2]

OP-AMP APPLICATIONS: The summing amplifier, Differential and instrumentation amplifiers, Voltage to current and current to voltage conversion, Differentiators and integrators, Non Linear Op Amp circuits, Precision rectifiers, log amplifier.

CLIPPERS & CLAMPERS : Positive and negative clippers, Positive and negative clampers, Absolute value output circuit, Peak detector, Sample and hold circuit.

OSCILLATORS: Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave generator, Triangular wave generator, Saw tooth wave generator. (14)

UNIT - III [Text Book-2]

CONVERTERS: D/A conversion fundamentals, Weighted resistor summing D/A Converter, R-2R Ladder D/A converter, A/D conversion: Parallel(flash) A/D converters, Ramp converters, Dual slope converters, Tracking A/D converters , Successive Approximation A/D converters.

ACTIVE FILTERS: Active LP and HP filters, Band pass filters: Wideband, Narrow Band pass filters, Band stop filters, , All pass filters, State variable filters. (16)

UNIT - IV [Text Book-2]

APPLICATIONS OF SPECIAL ICS: The 555 timer, 555 as Monostable and Astable Multivibrator and applications.Ic 566 voltage controlled oscillator, Phase Locked Loops, Operating principles, Monolithic PLLs, 565 PLL applications, A 723 Voltage Regulator and its design. (12)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Rama Kant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, PHI/ Pearson Education, 2003.*
2. *D.Roy and Choudhury, Shail B.Jain, Linear Integrated Circuits, 2nd Edition, New Age International, 2003.*

REFERENCE BOOKS:

1. *J.Michael Jacob, Applications and Design with Analog Integrated Circuits, 2nd Edition, PHI, 2003.*
2. *Denton J Dailey, Operational Amplifiers and Linear Integrated Circuit Theory and Applications,*

WEB REFERENCES:

1. *www.opamp-electronics.com*
2. *http://www.electronics-tutorials.ws/opamp/opamp_1.html*
3. *www.stanford.edu/class/ee281/handouts/lecture4.pdf*
4. http://frankshospitalworkshop.com/electronics/documents/Electronic_Devices_And_Circuits.pdf

III/IV Year B.Tech.- Sixth Semester

EE/EC- 322 MICROPROCESSORS AND MICROCONTROLLERS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *To understand the architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors.*
- *To develop the programming skills for applying them on various applications.*
- *Learning Digital Interfacing, Analog interfacing with 8086.*
- *Learning architecture, pin diagram, addressing modes of 8051, instruction setof 8051, counters and timers of 8051, interfacing with 8051.*

Learning Outcomes :

- *Students will be able to use 8086 microprocessor addressing modes, registers and instruction sets.*
- *Students will be able to debug their assembly language programs.*
- *Students will be able to understand Digital Interfacing, Analog interfacing with 8086.*
- *Students will be able to learn architecture of 8051, addressing modes of 8051, instruction set of 8051, counters and timers of 8051, interfacing with 8051.*

COURSE CONTENT :

UNIT - I **[Text Book-1]**

Microprocessor: introduction to microcomputers and microprocessors, introduction and architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors. (16)

UNIT - II **[Text Book-1]**

8086 programming and system connections: Program development steps, writing programs for use with an assembler, assembly language program development tools, writing and using procedures and assembler macros.

An example of minimum mode system, addressing memory and ports in microcomputer system. 8086 interrupts and interrupt responses. (15)

UNIT - III **[Text Book-1]**

Digital Interfacing: Programmable parallel ports, handshake IO, interface Microprocessor to keyboards. DAC principle of operation, specifications and different types of DACs and interfacing.

Analog Interfacing: A/D converter specifications, types, interfacing to different types of A/D converters.

Programmable devices: Introduction to Programmable peripheral devices 8254, 8259, 8251, DMA data transfer, RS232 communication standard and maximum mode of 8086 operation. (13)

UNIT - IV **[Text Book-2]**

Introduction:-Introduction to microcontrollers, comparing microprocessors and microcontrollers, Architecture:- Architecture of 8051, pin configuration of 8051microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts. Programming & interfacing 8051:- Addressing modes of 8051 microcontroller, Instruction set of 8051 microcontroller, simple programs using 8051 microcontroller. (16)

LEARNING RESOURCES

TEXT BOOKS:

1. *Duglus V. Hall, Microprocessor and Interfacing, Revised 2nd Edition, TMH,2006.*
2. *Kenneth J. Ayala, The 8051 Microcontroller Architecture Programming and Applications, 2nd Edition, Penram International Publishers (I), 1996.*

REFERENCE BOOKS:

1. *John Uffenbeck, The 80X86 Family, Design, Programming and Interfacing, 3rd Edition, Pearson Education, 2002.*
2. *Barry Bray, the intel microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium processors, architecture, programming, and interfacing, 6th Edition, PHI edition. Mohammed Ari Mazidi and Janci Gillispie, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/New_index1.html*
2. http://www.berk.tc/micropro/microlinks.htm

III/IV Year B.Tech.- Sixth Semester

EE-323 SWITCH GEAR & PROTECTION

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To get the student an idea of zones of protection and various types of relays.*
- *To make the student to gain the knowledge of various circuit breakers with their applications.*
- *To get the knowledge of differential protection of various power system network elements.*
- *To make the student to understand the principle of static relays and their applications.*
- *To make the student to understand the concept of grounding, soil resistivity and earth resistance.*

Learning outcomes:

- *Get an idea of zones of protection and various types of relays.*
- *Understand the knowledge of various circuit breakers with their applications.*
- *Get the knowledge of differential protection of various power system network elements.*
- *Gain the knowledge of static relays and their applications.*
- *Make the student to understand the concept of grounding, soil resistivity and earth resistance.*
- *Solve the problems related to circuit breaker and hence access the arc quenching ability of the dielectric medium.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Protective Relays : Introduction - basic requirement of protective relaying - zones of protection - primary and backup protection - classification of

relays - attracted armature, balanced beam, induction disc, thermal relays. Buchholz's relay. Over current - under voltage - directional and non-directional relays.

Distance relays - impedance, reactance, mho and off set mho relays.

Differential relays - circulating current and opposite voltage differential scheme. Negative sequence relays. (19)

UNIT - II [Text Book- 1]

Switchgear : Elementary principles of arc phenomenon - arc quenching - interruption of capacitive currents and low current chopping - resistance switching - recovery and restriking voltages. Principle of operation of various types of circuit breakers - air break - oil filled - air blast -vacuum and SF_6 circuit breakers. Rating, testing and specifications of circuit breaker. (13)

UNIT - III [Text Book- 1&2]

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines - field suppression of alternator - over current and distance protection for feeders - Translay relay.

Grounding : Neutral grounding - solid grounding - resistance and reactance grounding - Arc suppression coil.

Power System Earthing: Objectives - definitions - tolerable limits of body currents - soil resistivity and earth resistance. (12)

UNIT - IV [Text Book- 1 & Reference Book - 1]

Static Relays: Introduction - basic component of static relays. Comparators - amplitude and phase comparators. Over current relays - instantaneous over current relay - inverse time over current relays - differential relays. (12)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Power System Protection and Switchgear by B.Ram - Tata Mc-Graw Hill 2001.*
2. *Electrical power systems by C.L. Wadhwa, New age International (P) Limited*
3. *Fundamentals of Power System Protection by Y.G. Paithankar&S.R.Bhide, PHI, 2003.*

REFERENCE BOOKS:

1. *Power system protection Static relays by T.S. MadhavaRao TMH 2nd edition 1981*
2. *The Art and Science of protective relaying by Mason Wiley Eastern Ltd*
3. *Power system protection and switchgear by B. Ravindranath, Chander Willy Eastern Ltd 1992*
4. *Switchgear and protection by Sunil S. RaoKhanna Publications*

WEB REFERENCES:

1. *www.electrical4u.com*
2. *www.heinemannelectric.com.au/...*
3. *http://www.cdeep.iitb.ac.in/nptel/Electrical%20Engineering/Power%20System%20Protection/*

III/IV Year B.Tech.- Sixth Semester

EE- 324 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Lectures	*: 4 periods / week*	*]Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- To give overall view to the students regarding different measurement techniques employed in industrial applications.
- To discuss about various instruments used in electrical measurements.
- To make the student to understand the process of measuring resistance, inductance and capacitance during electrical engineering practice.
- To discuss the layouts of digital instruments, oscilloscopes and transducers.

Learning Outcomes:

- Analyze types of instruments and principle of operation of various analog and digital instruments used in laboratories and field practice.
- Understand the operation and maintenance of CTs and PTs.
- Measure the various parameters over a wide range in electrical and electronics field like resistance, inductance, and capacitance by selecting appropriate technique.
- Choose or design various circuits including magnetic materials for a variety of applications in electrical industry.
- Identify and operate various digital instruments, oscilloscopes, transducers, thermocouples etc. used in latest equipment, industries and advanced laboratories.
- Get the solutions for problems related to measurements in competitive examinations.

COURSE CONTENT :

UNIT - I [Text Book- 1]

Instruments: Classification of instruments - Construction and principle of operation of Permanent magnet moving coil - moving iron - dynamometer - induction type of instruments. Measurement of current, voltage, power, energy and reactive power in single phase and three phase circuits. (13)

UNIT - II [Text Book- 1]

Construction and principle of operation of Power factor meters - frequency meters and synchroscope.

Magnetic Measurements: Ballistic galvanometer -- B-H loop - flux meter - measurement of permeability.

Oscilloscope : Basic operation - deflection mechanism - time base circuits - vertical amplifiers - alternate and chop modes - applications, Digital storage oscilloscope - Principle and block diagram (11)

UNIT - III [Text Book- 1]

Instrument Transformers: CTs, PTs principle of operation - errors - testing.

Bridges: Measurement of inductance, capacitance and resistance by bridge methods - Maxwell's - Anderson's - Wien's - Schering's - Heaviside's - Campbell's - Kelvin's double bridge. Measurement of high resistance by Price's guard wire, loss of charge methods. (11)

UNIT - IV [Text Book- 1]

Digital Instruments: Principle of operation of DVM's - display devices LEDs and LCDs

Transducers: Principles - LVDT - frequency and power transducers

Measurement of Non electrical quantities with electrical transducers: Velocity, acceleration, Force, Torque, flow, temperature thermister - thermo couple, displacement & strain. Hall effect transducers Data recorders, data acquisition systems. (12)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Electrical & Electronic Measurement & Instruments by A.K.Shawney, Dhanpat Rai & Co 17th edition 2000.*
2. *Electrical Measurements and measuring Instruments - by E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing, 1999.*

REFERENCE BOOKS:

1. *Electrical Measurements - by Buckingham and Price, Prentice - Hall, 1961*
2. *Electrical Measurements by Harris John Wiley.*
3. *Electrical Measurements: Fundamentals, Concepts, Applications - by Reissland, M.U, New Age International (P) Limited, Publishers.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/video.php?courseId=1062*
2. *http://physics.kenyon.edu/EarlyApparatus/Titlepage Electrical _Measur ements.htm*
3. *http://en.wikipedia.org/wiki/Electrical_measurements*

III/IV Year B.Tech.- Sixth Semester

EE - 325 POWER ELECTRONICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background to understand the concepts of Various Power Electronics devices.*
- *To provide sufficient knowledge about how the AC voltages are converted in to DC voltages by using Phase controlled Rectifiers.*
- *To provide sufficient knowledge about how the DC voltages are converted in to AC voltages by using Inverters.*
- *To provide sufficient knowledge about how the DC voltages are controlled by using Choppers.*
- *To give an idea about how the frequency of system is controlled by using Cyclo converters.*

Learning outcomes:

- *Understand the concepts of Various Power Electronics devices and their applications.*
- *Design the Circuits to convert Ac voltages in to DC voltages.*
- *Know how the DC voltages are converted in to AC voltages by using Inverters.*
- *Design the Circuits to convert fixed DC voltages to DC variable voltages by using choppers.*
- *Design the Circuits to convert the frequency of the system by using Cyclo converters.*

COURSE CONTENT :

UNIT-I [Text Book- 1, 2]

Power devices : SCR - Theory of operation of SCR - Two transistor model of SCR - Characteristics and ratings - SCR turn on and turn off methods - Firing circuits R, RC, UJT and Ramp comparator Firing circuits - Protection of SCR - Series and parallel operation of SCRs - P-N-P-N devices - SCS, LASER, DIAC, TRIAC, IGBT, MOSFET and their

characteristics - ratings - TRIAC triggering and turn off methods - Introduction to digital firing schemes. (16)

UNIT-II [Text Book- 1]

Converters: Principles of phase controlled converter operation - single phase half wave converters - single phase semi converter and single phase full converters with R, RL types of load - single phase dual converter - three phase half wave converters - three phase full wave converters - three phase dual converter with R, L loads - effects of source and load inductance - pulse width modulation control for PF improvement. (13)

UNIT-III [Text Book- 2]

Inverters : Principle of inverter operation - single phase inverters- series, parallel inverters - Mc Murray Bedford half bridge inverters - three phase inverters (120,180 modes of operation) - voltage source inverters - current source inverters - pulse width modulated inverters. (12)

UNIT-IV [Text Book- 1, 2]

Choppers: Principle of choppers - step up and step down choppers - different classes of chopper circuits and their analysis - Speed control of DC motors.

Cyclo converters: Principle and operation of single - phase and three phasecyclo converters and applications. (12)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Power Electronics, circuits, devices and applications by M.H. Rashid Pearson 3rd edition, 2005.*
2. *Power Electronics by M.D.Singh and Khanchandani TMH, 2nd Edition.*

REFERENCE BOOKS:

1. *Power Electronics by P.S. Bhimbra Khanna publications, 3rd Edition 2006.*
2. *Power Electronics by W. Launder 2ndedition,1993.*
3. *Industrial Electronics & Robotics by Shaler&C.Menamee.*
4. *Power Electronics - by VedamSubramanyam, New Age International (P) Limited, 2ndedition 2006.*

WEB REFERENCES:

1. *www.powerelectronics.com; % reference for applications*
2. *www.mypptsearch.com/search-ppt/High%l % Reference for design problem*
3. *www.ieee.org/conferences_events/confe % for additional references*

III/IV Year B.Tech.- Sixth Semester

EE - 326/A HIGH VOLTAGE ENGINEERING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background to understand the concepts of Generation of High AC, High DC and High Impulse voltages.*
- *To make the student to Know how the generated high voltages are measured by using different measurement techniques.*
- *To provide sufficient knowledge about Corona and its effects.*
- *To teach the techniques to test the different High voltage Equipment and the how the wavelets are used to find fault detection in Electrical Engineering.*
- *To give an idea on Numerical Methods For Electrical Field Computation.*

Learning Outcomes:

- *Understand the concepts of Generation of High AC, DC and High Impulse voltages.*
- *Design the methods to measure the different high voltages in high voltage laboratory.*
- *Know how the effects of corona and the methods to reduce corona effects in High voltage engineering.*
- *Design the methods to test the different high voltage equipments in high voltage laboratory.*
- *Connect the course content to real time applications in various High voltage electrical electronics engineering applications.*
- *Get solutions for problems related to Electrical Fields by using Numerical methods.*

COURSE CONTENT :

UNIT-I [Text Book-2]

Generation Of Impulse Voltages: Standard specifications - standard wave shapes for testing - properties of double exponential wave shapes

- approximate estimate of wave shape control resistors - Multistage impulse generator - Energy of impulse generator.

Generation Of Impulse Currents: Standard specifications - analysis of impulse current generator.

Generation Of High D.C And A.C Voltages: Principle of Voltage Doubler circuit - Cockcroft-Walton cascade arrangement and its Mathematical analysis - cascade connection of transformers - Resonant transformers - Tesla coil. (12)

UNIT-II [Text Book-2]

Measurement Of High Voltages: General concepts of High voltage measurements - voltage Dividers (Resistive, Inductive and Capacitive) for impulse measurement. High speed Oscilloscope - peak voltmeter and Sphere gap. Use of fibre optics in H.V measurement of high voltage DC - Layout of high voltage lab. (16)

UNIT-III [Text Book-2]

Corona: Corona - factors affecting corona - critical voltages and power loss - Radio interference due to Corona.

High Voltage Testing Techniques: Testing of insulators - Bushings - isolators and CB's - Testing of transformers, Fault detection using Wavelets-theoretical aspects. (14)

UNIT-IV [Text Book-2]

Numerical Methods For Electrical Field Computation: Finite difference method - Finite element method - charges simulation methods - Boundary element methods. (11)

LEARNING RESOURCES:

TEXT BOOKS:

1. *High Voltage Engineering fundamentals by Kuffel, E, Zaengl W.S, Kuffel J (2nded.) Burrerworths Hsinemann.*
2. *High Voltage Engineering by M.S. Naidu &V.Kamaraju, TMH.*
3. *High voltage engineering by CL Wadhwa, New age International.*

REFERENCE BOOKS:

1. *High Voltage Laboratory techniques by J.D. Craggs&Meak Butter Worths scientific publications, London.*
2. *Extra High Voltage Engineering by Rakesh Das Begamudre, New Age International.*

3. *High Voltage measurement techniques by Schawab, M.I.T Press Cambridge, Massachusetts.*
4. *Transformers - BHEL 2nd edition, TMH.*
5. *Finite elements for electrical engineers by silvester and peter, CambridgeUniversity press 3rd edition, 1996.*

WEB REFERENCES:

1. *www.highvolteng.com; % reference for applications*
2. *informe.com/high/high_voltage_enginee/ % Reference for information about hv labs*
3. *www.mypptsearch.com/search-ppt/High%l % Reference for design problem*
4. *www.ieee.org/conferences_events/confe % for additional references*

III/IV Year B.Tech.- Sixth Semester

EE - 326/B ELECTRICAL MACHINE DESIGN

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To get the knowledge of Principles of design of static and rotating machines.*
- *To design main dimensions & cooling systems of transformers.*
- *To design main dimensions of rotating machines.*

Learning Outcomes:

After completion of the course the student will acquire.

- *knowledge in basic concepts of Electrical Machine Design.*
- *the calculations of mmf, no load current of transformers.*
- *Design of main dimensions of transformer, cooling systems.*
- *Design of main dimensions of DC machine & field circuit.*
- *Design of main dimensions of Induction motor & rotor.*
- *Design of main dimensions of Synchronous Machine & field circuit.*
- *understand the principles of computerized design of machines limited to above background.*

COURSE CONTENT :

UNIT-I [Text Book - 1]

D.C.Machines : E.M.F generated from full pitch - fractional pitch with and without distributed windings - distribution factor. Design of main dimensions from output equation - Design of Armature windings - Design of field system - Design of inter pole and commutator. (15)

UNIT-II [Text Book - 1]

Transformers: Derivation of output equation - volt per turn importance and calculation of main dimensions for three phase and single phase transformers - window dimensions - Yoke design and coil design - Design of tank with tubes. (15)

UNIT-III [Text Book - 1]

Induction Motor: Derivation of output equation - calculation of main dimensions - Stator design - number of slots - shape and area of slots - Rotor design for squirrel cage and slip ring types. (17)

UNIT-IV [Text Book - 1]

Synchronous Machines: Derivation of output equation - Calculations of Main Dimensions for salient pole and cylindrical rotor alternators - Stator design - number of stator slots and slot dimensions - Pole design for salient pole generators - pole winding calculations. Design of rotor for cylindrical rotor alternator - Design of rotor windings.

Computer Aided Design: Advantage of computer aided design - Flow chart for computer aided design. [13]

LEARNING RESOURCES:

TEXT BOOKS:

1. *A Course in Electrical machine Design by A.K. Sawhney, Dhanpatrai& Sons,*
2. *Performance and Design of AC Machines by M.G. Say CBS.*
3. *Principles Of Electrical Machine Design by R.K. Agarwal, S.K. Kataria&Sons,2010.*
4. *Computer aided design of electrical equipment by M. Ramamoothy Affiliated East West press Pvt Ltd New Delhi.*

REFERENCE BOOKS:

1. *CEDT Manual on design and technology on low power transformers and inductors by IISC, Bangalore.*
2. *Design of Electrical Machines by V.N.MittleStandard Publishers Distributors 2009.*
3. *Performance and Design of AC Machines by A.E. Clayton.*

WEB REFERENCES:

1. *http://www.faadooengineers.com/threads/9454-Electrical-Machine-Design-full-notes-e-books-pdf-all-units*
2. *http://nptel.iitm.ac.in?*

III/IV Year B.Tech.- Sixth Semester

EE - 326/C OPERATIONS RESEARCH

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The objective of this course is to help students getting the following capabilities and competencies:

- *Grasp the methodology of OR problem solving.*
- *Understand and differentiate deterministic/probabilistic/stochastic static/dynamic problem solving situations.*
- *Develop formulation skills in building models*
- *Understand the basics in the field of queuing and game theory.*
- *Be able to understand and interpret solutions with simulation and decision theory.*

Learning Outcomes:

- *The student will developed the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling frame work.*
- *Develop linear programming models that consider the key elements of the real world problem.*
- *Interpret the models' solutions and infer solutions to the real-world problems.*
- *Recognize and solve transportation and assignment problems.*
- *Explain the basics in the field of queuing models and Game theory.*
- *Know when simulation and decision theory can be applied in real-world problems.*

COURSE CONTENT :

UNIT - I [Text Book - 1]

Linear Programming : Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, duality, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution. (15)

UNIT - II [Text Book - 1]

Transportation Problem : Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model.

Assignment Problem: One-to-one assignment problem, optimal solution, unbalanced assignment matrix. Flight scheduling problems, Traveling salesman problem. (15)

UNIT - III [Text Book - 1]

Queuing Theory: Queuing systems and their characteristics. Analysis of Markovian chains, Transition diagram, M/M/1 : FCFS/ α / α and M/M/1 : FCFS/ α / N queuing models.

Theory of games: Introduction, Rectangular two person zero person games, solution of rectangular games in tems of mixed strategies , solution of 2x2 games without saddle points, concept of dominance to reduce the given matrix , graphical method for 2xn and mx2 games. (15)

UNIT - IV [Text Book - 1]

Simulation: Definition and applications. Mantel Carlo simulation. Random numbers and random number generation: Mixed congruential method, additive congruential method and multiplicative congruential method. Application problems in queuing and inventory.

Decision Theory: Introduction , decision under certainty , Decision under risk- expected value criterion , expected value combined with variance criterion , decision under uncertainity , decision tree. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Operations Research - H.A. Taha , Pearson , 7th Edition, June 2002.*
2. *Introduction to Operations Research-Hiller and Liberman, MGH ,7th Edition 2002.*
3. *Operations Research - R. Pannerselvam , PHI , 2nd Edition, 2006.*
4. *Quantitative techniques for management - V.Vohra , TMH , 3rd Edition.*

REFERENCES:

1. *Introduction to Operations Research - Phillips, Ravindran, James Solegerg Wiley 1976.*

2. *Optimization Theory and Applications - S.S. Rao, Wiley 1979.*
3. *Operations Research - S.D. Sharma, Kedar nath Ram nath & Co, 11th Edition , 2002.*
4. *Operations Research - Gupta and Hira , S. Chand , 2008.*

WEB REFERENCES:

1. *http://www2.informs.org/Resources/*
2. *http://www.mit.edu/~orc/*
3. *http://www.ieor.columbia.edu/*
4. *http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm*
5. *http://www.wolfram.com/solutions/OperationsResearch/*

III/IV Year B.Tech.- Sixth Semester

EE - 326/D ANN AND FUZZY SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.
- The goal of this course is to give a good basic understanding of Neural Networks and Fuzzy Logic.

Learning Outcomes:

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To teach about the concept of fuzziness involved in various systems.
- To provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
- To provide adequate knowledge of application of fuzzy logic control to real time systems.

COURSE CONTENT :

UNIT - I [Text Book 3]

Artificial Neural Network : Concept - evolution - basic models - Notation and terminology - training Supervised learning Network: Introduction - Perceptron networks - Adaptive linear neuron - Multiple adaptive linear neurons - Back propagation network - radial basis network. (11)

UNIT-II [Text Book 3]

Associative Memory Networks: Training algorithms for pattern association - Auto associative memory network - Bidirectional associative memory - Hopfield networks - Iterative auto associative memory networks - Temporal associative memory network.

Unsupervised learning networks: Fixed weight competitive nets - Kohenenself organizing feature maps - learning vector quantization - counter propagation networks - Adaptive resonance theory network. (13)

UNIT- III [Text Book 3]

Fuzzy logic : Classical sets - fuzzy sets - classical relations - fuzzy relations - tolerance and equivalence relations - Membership functions - fuzzification - Membership value assignments - Defuzzification - Fuzzy arithmetic - Fuzzy measures - Fuzzy rule base and approximate reasoning - fuzzy decision making. (10)

UNIT - IV [Text Book 3]

Hybrid fuzzy neural networks: Hybrid system - fuzzy logic in learning algorithms - fuzzy neurons - Neural networks as pre-processors, post processors, tuners - FNN architecture based on back propagation - ANFIS (13)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Principles of soft computing by S.N.Sivanandam, S.N.Deepa, John Wiley India - 2007.*
2. *Fuzzy logic and Neural networks: Basic concepts and applications by Chennakesava R Alavala, New Age International (P) Ltd., 2008.*
3. *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai - PHI Publication.*

REFERENCE BOOKS:

1. *Neural Networks - James A Freeman and Davis Skapura, Pearson Education, 2002.*
2. *Neural Networks - Simon Hakins , Pearson Education.*
3. *Neural Engineering by C.Eliasmith and CH.Anderson, PHI.*
4. *Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.*

WEB REFERENCES:

1. *http://users.abo.fi/rfuller/nfs.html*
2. *http://www.rejinpaul.com/2012/04/ic2403-neural-networks-and-fuzzy-logic.html*
3. *www.neptel.iim.ac.in*
4. *http://en.wikipedia.org/wiki/Artificial_neural_network*
5. *http://machine-learning.martinsewell.com/ann/*
6. *http://neurosci.wikidot.com/artificial-neural-network*

III/IV Year B.Tech.- Sixth Semester

EE - 326/E DIGITAL SIGNAL PROCESSING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background about signals and systems.*
- *To make the student to learn about Laplace & Fourier transformations.*
- *To understand and differentiate the difference between DFT & FFT Transforms.*
- *To make the student to design IIR filters.*
- *To make the student to design FIR filters.*
- *To study the realization of digital filters and to know the difference between analysis and realization.*

Learning outcomes:

The student is expected to

- *Get familiarity with discrete time signal processing and characterization of random signals filter design techniques.*
- *Learn how to calculate the discrete Fourier series and Fourier transform for discrete time systems, discrete Fourier transform using FFT algorithms.*
- *Learn the theory of modern digital signal processing and digital filter design, including window's techniques involving digital filter design and digital simulation experiments.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications*
- *Expertise the fundamental principles and techniques of digital signal processing for understanding and designing new digital signal processing systems and for continued learning.*

COURSE CONTENT :

UNIT - I [Text book-1,Text book-4]

Discrete Signals and Systems: Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems.

Z-Transforms: Z-transforms, Region of convergence, Z-transform theorems and properties, Parseval's relation, Relation between Z-transform and Fourier transform of a sequence, Inverse Z transform using Cauchy's integration theorem, Partial fraction method, Long division method, Solution of differential equations using one sided Z-transform, Frequency response of a stable system. (16)

UNIT - II [Text book-2,Text book-1]

DFT And FFT: Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT.(16)

UNIT - III [Text book-1, Reference book-2,Text book-4]

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method. (12)

UNIT - IV [Reference book-1,Text book-4]

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: Rectangular window, Hanning window, Hamming window, Generalised Hamming window, Bartlett triangular window, Comparison of IIR and FIR filters.

Realisation Of Digital Filters: Direct, Canonic, Cascade, Parallel and Ladder realizations. (18)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.*

2. *S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003.*
3. *Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, PearsonEducation/PHI, 2004.*
4. *P.RameshBabu, Digital Signal Processing, 2nd Edition, Scitech Publications, 2004.*

REFERENCE BOOKS:

1. *Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.*
2. *Andreas Antoniou, Digital Signal Processing,TMH, 2006.*
3. *JohnG.Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003.*

WEB REFERENCES:

1. *www.ee.nctu.edu.tw/~cfung/courses/2011_2012/DSP/.../notes.htm % Lecture notes*
2. *inst.eecs.berkeley.edu/~ee123/ % Refence for flowgraphs, realization, FFT, DFT*
3. *ethesis.nitrkl.ac.in/71/1/10407030.pd % Reference for applications*
4. *www.springer.com › Home › Engineering › Signals & Communication % Algorithms for signal processing*

III/IV Year B.Tech.- Sixth Semester

EE - 361

ELECTRICAL MEASUREMENTS LAB & WORKSHOP PRACTICE

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 2*

Course Objectives:

- *To know the procedures for measuring Resistance, Inductance and Capacitance of different ranges.*
- *To perform experiments to measure three phase power, frequency, core losses.*
- *To design experiments for calibration of energy meter.*
- *To know the industrial practices of Measuring earth resistance, dielectric strength of transformer oil & Testing of underground cables*
- *To provide hands on practice with various equipment during workshop practice.*

Learning Outcomes:

Upon the completion of this lab the student attains

- *An ability to measure various electrical engineering parameters used in engineering practice.*
- *An ability to calibrate and check the operation of energy meter.*
- *An ability to measure earth resistance.*
- *An ability to calculate core losses of magnetic material.*
- *A Capability to use transformer oil testing kit.*
- *Hands on experience with equipment in workshop practice lab.*

LIST OF EXPERIMENTS:

Electrical Measurements:

1. Calibration and testing of single - phase energy meter.
2. Kelvin's Double Bridge - Measurement of resistance - Determination of tolerance.
3. Schering Bridge - capacitance measurement and tan measurement
4. Anderson Bridge - inductance measurement.

5. Measurement of 3-phase active and reactive power in three phase circuits.
6. Measurement of frequency using CRO.
7. Measurement of strain using strain gauge.
8. Tracing of B-H curve using CRO.
9. LVDT characteristics, calibration and displacement measurement.
10. Energy meter calibration by phantom loading.
11. Frequency measurement by Wein's Bridge.
12. Measurement of earth resistance by earth resistance tester & fall of potential method.
13. Measurement medium resistance using Wheatstone Bridge.
14. Testing of current transformer.
15. Measurement of dielectric strength of transformer oil by transfer oil testing kit.
16. Fault identification and location in underground cables .

Workshop Practice:

1. Assembling and testing of AC regulator and 3 point starter.
2. Design and testing of Single phase rectifier.
3. Industrial Wiring.
4. Assembling and testing of Ceiling fan.
5. Assembling and testing of various components of fluorescent lamp
6. Binding of insulators.
7. Substation layout & Design of UG cable.
8. Identification of terminals of DC compound motor.

NOTE: A minimum of 10(Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for End Semester Examination.

LEARNING RESOURCES:

REFERENCE BOOK:

1. Electrical & Electronic Measurement & Instruments by A.K.Shawney Dhanpat Rai & Co 17th edition 2000.

III/IV Year B.Tech.- Sixth Semester

EE/EC-362 MICROPROCESSORS AND MICROCONTROLLERS LAB

Practicals :	*3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course objectives:

- *To develop the microprocessor and microcontroller based programs for various problems*
- *To develop the microprocessor and microcontroller based programs for various applications.*

Learning Outcomes :

- *To gain the logical development of programs on the 8086 micorprocessor and 8051 microcontroller.*
- *To understand how to interface o 8086 microprocessor and 8051 microcontrolle for various simple applications*

LIST OF EXPERIMENTS :

Experiments Based on ALP (8086)

1. Programs on Data Transfer Instructions.
2. Programs on Arithmetic and Logical Instructions.
3. Programs on Branch Instructions.
4. Programs on Subroutines.
5. Sorting of an Array.
6. Programs on Interrupts (Software and Hardware).
7. 8086 Programs using DOS and BIOS Interrupts.

Experiments Based on Interfacing with 8086 and Experiments Based on Microcontroller (8051)

8. DAC Interface-Waveform generations.
9. Stepper Motor Control.
10. Keyboard Interface / LCD Interface.
11. Data Transfer between two PCs using RS-232 C Serial Port

12. Programs on Data Transfer Instructions using 8051 Microcontroller.
13. Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.
14. Applications with Microcontroller 8051.

NOTE: A minimum of 10(Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for End Semester Examination.

III/IV Year B.Tech.- Sixth Semester

EE/EC- 363 ADVANCED COMMUNICATION SKILLS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course objectives:

- *To expose the students to a variety of learner-friendly methods of language learning*
- *To train the students to use language effectively to face interviews, group discussion and public speaking*
- *To initiate the students to speak better*
- *To expose the students to corporate etiquette*
- *To develop proficiency in presentation*
- *To train the students in speech writing*
- *To develop employability skills*
- *To develop civic sense and concern to the society*

Learning Outcomes :

- *The student develops a variety of learner -friendly methods of language learning*
- *The students are capable of using language effectively to face interviews, group discussion and public speaking*
- *The students develop confidence level to speak better*
- *The students learn the corporate etiquettes*
- *They are proficient in presentations*
- *The students develop felicity of expression*
- *The students develop employability skills*
- *The students turn out to be responsible and become service minded.*

LIST OF EXPERIMENTS:

1 Mployability skills - Interview skills

2 Critical appreciation

- Poems
- Short stories
- Life stories
- Excerpts of great personalities

3. Film clippings
4. Briefing and explaining
5. Board room discussions
6. Presentations
7. Mini Projects

   Assignment on - Visiting orphanages, old age homes, hospitals, bank, traffic etc.,

8. Speech writing
   - Acceptance speech
   - Hosting
   - Vote of thanks
   - Introducing people on the stage
   - Farewell speech
   - Compeering
   - Commentary
   - Thank you speech

LEARNING RESOURCES:

BOOKS:

1. *Soft skills for Everyone - Jeff Butterfield Cengage learning First print 2010, Third Indian Reprint 2012*
2. *Personality Development and Soft Skills - Barun K.Mitra Oxford University Press , First published 2011.*

IV/IV Year B.Tech.- Seventh Semester

EE/EC- 411 INDUSTRIAL MANAGEMENT

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives :

- *The course provides the students with a foundation of knowledge in management of today's organizations.*
- *The course gives an idea about which form of business organization is suitable for today's business environment and their impact towards society.*
- *The course alerts the students to understand the time value of money for evaluation of several project alternatives.*
- *The course guides the students for accounting the depreciation and providing the funds for replacement of necessary and depreciated machinery and equipment.*
- *The course is to sensitize the students to the changing environment and its implication for managing the human resources to achieve the corporate excellence in a changing environment.*
- *The course provides knowledge to the students for avoiding any delays in production processes due to non availability of material by effectively managing the function of management.*
- *The course provides a business organization which produces a very good quality products but it must satisfy the needs, wants and desires of the consumer.*

Learning Outcomes :

- *The course helps the students to become aware of the inference of organization*

  structure and performance of people working in organizations.
- *The course helps the students to develop themselves as individual entrepreneurs for the society.*
- *The course helps the students to get awareness about the optimum organization of funds and its mobilization.*

- *The course helps to linkage corporate vision, mission, strategies, and policies to human resource management to acquire competitive advantage.*
- *The course helps the students to use right sort of material for delivering the right product.*
- *The course helps the students to understand the customer perception, making him to buy the products and retaining the customer in a business.*

COURSE CONTENT :

UNIT - I [Text Book-1]

GENERAL MANAGEMENT: Management Concept, Managerial Roles,Managerial Skills, Brief treatment of managerial functions,Scientific Principles of Management, Administrative Principles of Management.

FORMS OF BUSINESS ORGANISATION: Salient features of sole proprietorship. Partnership, Joint Stock Company, Private limited and Public limited companies. (14)

UNIT - II [Text Books - 1,2]

FINANCIAL MANAGEMENT: Objectives of Financial Management, Concept of interest, compound interest, equivalent cash flow diagram

ECONOMIC EVALUATION OF ALTERNATIVES: Basic methods, the annual equivalent method, present worth method, future worth method.

DEPRECIATION: Purpose, types of depreciation, common methods of depreciation. The straight line method, declining balance method, the sum of the years digits method. (17)

UNIT - III [Text Book-1]

HUMAN RESOURCE MANAGEMENT: Functions of Human Resource Management - Job Analysis, Human Resources Planning, Brief treatment of Recruitment, Selection, Placement, Induction & Orientation, Training and Development, Performance Appraisal, Job Evaluation, Career Planning and Development, Stress Management, Compensation

Directing: Motivation and Leadership, Theories of motivation and styles of Leadership. (14)

UNIT - IV [Text Book-1]

MATERIAL MANAGEMENT: Functiions of Materials Management, Material Requirement Planning, Purchasing, Objectives of Purchasing,

Source Selection, Procurement Methods, Vendor Rating ,Inventory Management -EOQ, EPQ, ABC Analysis,FSN Analysis,VED Analysis.

MARKETING MANAGEMENT: Functions of Marketing, Marketing Mix,Product life cycle, Channels of distribution, Marketing Segmentation,Advertising & Sales promotion, Market Research. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. *KK Ahuja, Industrial Management, Vol. I & II, Dhanpat Rai, 1978.*
2. *E.Paul Degarmo, John R Chanda, William G Sullivan, Engineering Economy, Mac Millan Publishing Co, 1979.*

REFERENCE BOOKS:

1. *Philip Kotler, Marketing Management, 11th Edition, Pearson Education, 2004.*
2. *P. Gopalakrishnan, Hand Book of Materials Management, PHI, 1999.*
3. *Gary Dessler,Human Resource Management,11th Edition,2008.*
4. *Heinz Weirich and Harold Koontz, Management, 10th Edition, TMH, 2004.*

WEB REFERENCES:

1. *www.managementstudyguide.com: Describes the Concepts of Management & Its Operational Functions*
2. *www.1000ventures.com :*
3. *Describes about Management Gurus, Business Gurus*
4. *www.citehr.com : Describes the Human Resource Management Topics*

IV/IV Year B.Tech.- Seventh Semester

EE - 412 POWER SYSTEM OPERATION AND CONTROL

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The main objectives of this course are

- To give the overall idea of operation and control of a power system to a power engineering student.
- To make the student to understand economic load dispatch under various operational constraints and techniques to solve the problem.
- To develop skills for applying them in future on various engineering applications.
- To know the importance of quality of power, P-f, Q-V control loops, AGC.
- To discuss the concept of reactive power and voltage control in detail.
- To understand the concept of various FACTS devices in brief.
- To understand the power system control centres.

Learning outcomes:

The student will be able to

- Know the importance of economic operation of power systems, control of power and frequency.
- Control the voltage and reactive power in practical case also.
- Know the importance of single area and two area AGC.
- Connect the course content to real time applications in various electrical and electronics engineering applications.
- Know the importance of voltage control of distribution systems.
- Solve the Power management problems in industries and utilities.
- Get solutions for problems related to power systems in competitive examinations.

COURSE CONTENT :

Unit - I [Text Book- 1]

Economic operation of power systems: Economic dispatch in thermal power station: Heat rate curves - cost curves - incremental fuel and production costs - economic distribution of load between units without consideration to line losses. Transmission line losses as a function of plant generation - calculation of loss coefficients - optimum generation allocation between thermal plants. (14)

Unit - II [Text Book- 1]

Load frequency control: Importance of keeping voltage and frequency constant in a power system - Load frequency control (LFC) single area case - P- loop: Schematic of load frequency and AVR of a synchronous generator - mathematical modeling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation - LFC block diagram of an isolated power system - steady state analysis - dynamic response. LFC for two area systems - Automatic generation control (AGC) scheme - AGC in a single area and two area systems - block diagram representation. (22)

Unit - III [Text Book- 1]

Reactive power and voltage control: Loadability of transmission lines - sources ofreactive power

Reactive power control in synchronous generators: The role of excitation systemexciter,generator and sensor models - simplified AVR block diagram - steady stateresponse for a step change in terminal voltage.

Reactive power compensation of loads : Shunt compensating devices

Transmission line compensation : Series compensation - shunt compensation. StaticVAR compensators - thyristor controlled reactors (TCR) - thyristor switched capacitors(TSC) - combined TCR and TSC - schematic of all three types - STATCOM and FACTSdevices

Voltage control of distribution systems: Tap changing - booster transformers -synchronous phase modifiers - induction regulators and static capacitors. (15)

Unit - IV [Ref. Book- 3]

Power System Control centers: Aim of control centres, functions of

control centres - planning, monitoring and Data acquisition and control. Setup, locations, central facilities - civil facilities, facilities in control room. Communication - PLCC. Emergency control. (9)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Modern power system analysis by D.P. Kothari & I.J. Nagrath McGraw Hill 3rd edition,2003.*
2. *Electric Energy systems Theory - by O.I.Elgerd, Tata Mc Graw-hill Publishing Comapany Ltd., Second edition 1983.*
3. *Power system control- technology by Torsten Cegrell, Prentice Hall international series in systems & control engineering.*
4. *Electrical power systems by C.L. Wadhwa, New age International (P) Limited 4th Edition, 2006.*
5. *Understanding FACTS by Naran G. Hingorani, L. Gyugyi, 1st edition,2001,Standard Publishers Distributors.*

REFERENCE BOOKS:

1. *Economic operation of interconnected systems by L.K.Kirchmeyer Wiley Eastern Ltd.*
2. *Power system analysis by H. Saadat , McGraw Hill, 2nd edition.*
3. *Power System Analysis Operation and Control by Abhijit Chakrabarti, Sunita Halder, PHI, 3rd Edition, 2011.*
4. *Computer modeling of Electrical power systems by J.Arrillaga, N. A. Watson,second Edition2003, John Wiley & Sons, Ltd.*
5. *Elements of power system analysis by W D Stevenson Jr Fourth Edition TMH International student edition.*

WEB REFERENCES:

1. *www.learnerstv.com/Free-Engineering*
2. *www.engr.usask.ca/departments/ee*
3. *www.elearning.vtu.ac.in/Programme12/E-Notes/PSOC/MSR.pdf*
4. *www.freevideolectures.com/.../Power-Systems-Operation-and-Control*
5. *www.unr.edu/ebme/academics/courses*
6. *www.cdeep.iitb.ac.in/nptel/Electrical*
7. *www.cramster.com/answers*
8. *www.power.uwaterloo*

IV/IV Year B.Tech.- Seventh Semester

EE- 413 POWER SYSTEM ANALYSIS & STABILITY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background to understand the analysis of power system in steady state.*
- *To develop skills for applying them in future on various engineering applications.*
- *To teach the representation of PU system.*
- *To make the student to learn symmetrical components and sequence networks.*
- *To give an idea on fault analysis and stability assessment.*

Learning outcomes:

- *Skill to draw one line diagrams and understanding of solving per unit computations.*
- *An ability to form ZBUS matrix of any power system network and understanding of fault analysis.*
- *Skill to assessment of stability of power system network.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications.*
- *Get solutions for problems related to power systems in competitive examinations.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Representation of power systems: One line diagram - Impedance and Reactance diagrams - perunit quantities - changing the base - selection of base - per-unit impedances of three winding transformers - Advantages o per-unit computations (9)

UNIT - II [Text Book- 2]

Power flow control: Power angle equation of a synchronous machine-effect of synchronous machine excitation - power angle equation for power system with single and multi machines.

Symmetrical Faults: Transients in RL series circuit - short-circuit currents and reactances of synchronous machines - internal voltages of loaded machines under transient conditions - selection of circuit breakers (13)

UNIT - III [Text Book- 1]

Symmetrical components and Networks: Introduction - operator 'a' - resolution of three unbalanced phasors into symmetrical components - power in terms of symmetrical components.

Unsymmetrical series impedance - sequence impedances and sequence networks of unloaded generators , circuit elements. Positive negative and zero sequence networks.

Phase shift in STAR/DELTA transformer banks

Unsymmetrical Faults: Single line to ground - line to line and double line to ground faults on an unloaded alternator. Unsymmetrical faults on power systems - single line to ground line to line and double line to ground faults. Interpretation of the interconnected sequence networks. Analysis of unsymmetrical faults using bus impedance (19)

UNIT - IV [Text Book- 2]

Power system stability: Introduction - steady state stability, Transient stability, Review of machine swing equation - Equal area criterion of stability - applications. Step by step solution of the swing curve - factors affecting steady state and transient stabilities. (9)

LEARNING RESOURCES:

TEXT BOOKS:

1) *Elements of power system analysis by W D Stevenson Jr Fourth Edition TMH International student edition.*
2) *Modern power system analysis by D.P. Kothari and I.J. Nagrath , TMH 3rd edition.*
3) *Electrical power systems by C.L. Wadhwa, New age International (P) Limited*
4) *Power system analysis by TK Nagsarkar and Sukhija, Oxford press.*

REFERENCE BOOKS:

1) *Power system stability by KimbarkVol - I Willey Publications , Inc.*
2) *Power system stability and control by P. Kundur , TMH.*
3) *A. R. Bergen and V. Vittal; "Power System Analysis", Pearson Publication.*

WEB REFERENCES:

1. *http://www.site.uottawa.ca/~rhabash/ELG3311L11.pdf %Reference for one line diagrams*
2. *http://www.oocities.org/engrabda/aps/p/20.html %Reference for Impedance/ Reactance diagrams*
3. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/chapter_6/6_7.html %Reference for symmetrical faults*
4. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/chapter_8/8_1.html %Reference for Unsymmetrical faults*
5. *http://www.mkpalconsulting.com/files/stabilitybook.pdf %Reference for Power system stability*

IV/IV Year B.Tech.- Seventh Semester

EE - 414 INDUSTRIAL DRIVES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *The main objectives of this course are*
- *To discuss various types of drives, dynamics of industrial drives and control loops of drives.*
- *To discuss DC motor drives elaborately.*
- *To understand induction motor drives and synchronous motor drives.*
- *To introduce the vector control of AC motor drives, concept of space vectors.*

Learning outcomes:

The student will be able to

- *Check the operation of drives used in real industrial applications.*
- *Design DC and AC motor drives to suit the requirement of industry.*
- *Design drive circuits for special motors.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Introduction: Electric drives - advantages of electric drive- Type of electric drives-components of electric drives - Status of dc and ac drives.

Dynamics of Electric Drives: Fundamental torque equations - Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters - Components of load torques - some common load torques - Nature and classification of load torques.

Control of Electric Drives: Modes of operation - Speed control and drive classification - closed-loop control of drives. (14)

UNIT - II [Text Book- 1], [Ref. Book- 1]

DC motor Drives: DC motors and their performance - Starting - methods of braking - speed control -Methods of armature voltage control - Transformer and uncontrolled rectifier control.

Controlled Rectifier fed DC Drives: Single phase fully and half controlled rectifier control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor - comparison of conventional and static Ward-Leonard schemes - Rectifier control of dc series motor.

Chopper fed DC Drives: Control of separately excited dc motors - Chopper control of series motor. (21)

UNIT - III [Text Book- 1]

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances - Starting - braking - transient analysis - Speed control - pole amplitude modulation - stator voltage control - Variable frequency control from voltage and current sources - Eddy current drives - rotor resistance control - slip power recovery - Variable speed constant frequency generation. (14)

UNIT - IV [Text Book- 1]

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply - Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives - brush less dc motors - stepper motors - variable reluctance motor. (11)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Fundamentals of Electric drives by G.K. Dubey, Narosa, 2001.*

REFERENCE BOOKS:

1. *Power Semiconductor controlled drives by G.K. Dubey , PH,1989.*
2. *Power semiconductor drives by S.B. Dewan, G.R. Selmon & Straughen, John Wiley, 1984.*
3. *Thyristorised power controllers by GK Dubey SR Doradla, New Age.*
4. *Electric drives by Nisit K De and P.K. Sen, PHI 2006.*

WEB REFERENCES:

1. *www.siemens.com/Sirius*
2. *www.minglebox.com*
3. *www.abb.com*
4. *www.kalasalingam.ac.in*
5. *www.drives-and-controls.co.uk*
6. *www.emersonindustrial.com*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

EE - 415/A RENEWABLE ENERGY SOURCES

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 3*

Course Objectives:

- *To know the depletion rate of conventional energy resources and importance of renewable energy resources.*
- *To know alternate viable energy sources to meet the energy requirements.*
- *To discuss about solar energy, wind energy, tidal energy and geothermal energy as alternate resources.*

Learning Outcomes:

The student will be able to

- *Know the National scene of energy production, utilization, consumption and reserves.*
- *Appreciate the need for non-conventional energy sources.*
- *Understand relative advantages and disadvantage of various non-conventional energy sources.*
- *Understand basic heat transfer principle, storage methods available, working and construction related to solar collectors.*
- *Understand the assessment of wind energy potential, wind turbines and wind generators.*
- *Know about ocean energy, geo thermal energy and bio energy.*

COURSE CONTENT :

UNIT-I [Text Book- 1]

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management. (9)

UNIT-II [Ref. Book- 2]

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion-solar thermal central receiver systems - photovoltaic energy conversion - solar cells - 4 models. (11)

UNIT-III [Text Book- 1, Ref. Book- 2]

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator. (13)

UNIT-IV [Ref. Book- 1]

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction - tides - simple single pool tidal system.

Geothermal Energy: Origin and types - Bio fuels - classification - direct combustion for heat and electricity generator - anaerotic digestion for biogas - biogas digester - power generation. (16)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon*
2. *Renewable Energy Sources: Their impact on global warming and pollution by Abbasi & Abbasi -PHI*

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill

2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

WEB REFERENCES:

1. *http://www.tn.gov.in/spc/tenthplan/CH_11_2.PD*
2. *http://bieap.gov.in/Nonconventionalenergysourses*
3. *http://www.em-ea.org/Guide%20Books/book-4/4.12App%20of%20Non%20conventional*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

EE - 415/B UTILIZATION OF ELECTRICAL ENERGY

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To make students to learn the usage of electrical energy for various applications such as illumination, heating, welding etc.*
- *To provide specific knowledge on Principles and characteristics of storage batteries*

Learning Outcomes:

After completing this course, students will be able to:

- *Know to utilize the electrical energy for production of heat and welding process*
- *Design heating elements such as furnaces and ovens*
- *Know the lighting calculations for different kinds of applications*
- *Gain knowledge on storage cells*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Illumination : Introduction- terms used in illumination-laws of illumination-Gas discharge lamps - Fluorescent lamps - Arc lamps - Filament lamps - comparison between filament and fluorescent lamps-square law methods of calculation - Factory lighting - flood lighting and street lighting-design of lighting schemes-introduction to Compact Fluorescent Lamps. (12)

UNIT - II [Text Book- 1]

Electric Heating: Introduction; Modes of heat transfer - Stefan's law - classification of electric heating methods- design of heating element - Construction and working of different types of induction furnaces - resistance furnace - Dielectric heating - arc furnaces . (13)

UNIT - III [Text Book- 1]

Welding: Introduction- Types of welding - resistance and arc welding - Characteristics of Carbon and metallic arc welding - comparison

(Excluding electronic controls)- requirements of good weld-ultra sonic-electron beam-laser beam welding. (10)

UNIT - IV [Text Book - 2]

Storage batteries: Applications-rating-classification-dry cell and wet cells-primary and secondary cells-charging and discharging of lead acid cells, trickle charging-methods of charging lead acid batteries-over discharging-common troubles with lead acid batteries and remedies-Nickel cadmium batteries . (10)

LEARNING RESOURCES:

TEXT BOOKS :

1. *Utilization Electric Power and electric traction by J.B. Gupta, publishers-Katson books*
2. *Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna*

   publishers.

REFERENCE BOOKS:

1. *Art and Science of Utilization of Electrical Energy by Partab H Dhanpat Rai and Sons, New Delhi. Second edition*
2. *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., 2001.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/video.php?subjectId=108105060*
2. *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Illumination%20Engg/New_index1.html*
3. *www.bee-india.org*
4. *www.eia.doe.gov*
5. *www.irfca.org*

Elective -II (OPEN)

IV/IV Year B.Tech.-Seventh Semester

ME - 415/A ROBOTICS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.*
- *To provide the details of operations for a variety of sensory devices that are used on robot , the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.*
- *The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control.*

Learning Outcomes:

- *At the end of the course, students will be familiarized in basic components of robotics, classification of robots, robot grippers, Robot sensory devices, and transformations and kinematics of robot joints.*
- *An ability to apply knowledge of geometry, linear algebra, and dynamics to complex mechanical systems.*
- *An ability to design a robot mechanism to meet kinematics requirements.*
- *An ability to formulate, and solve complex kinematics and dynamics problems in robotics.*

COURSE CONTENT :

UNIT - I

Introduction to Robotics, major component of a robot, robotic like devices, classification of robots - Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation, economic analysis, overview of robot application. (15)

UNIT - II

Robot End Effectors: Introduction, end effectors, interfacing, types of end effectors, grippers and tools, considerations in the selection and design of remote centered devices. (15)

UNIT - III

Robotic Sensory Devices : Objective, Non-optical position sensors - potentiometers, synchros, inductocyn, optical position sensors - opto interrupters, optical encoders (absolute & incremental)

Proximity Sensors : Contact type , non contact type - reflected light scanning laser sensors.

Touch & Slip Sensors : Touch sensors - proximity rod & photo detector sensors, slip sensors - Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors. (15)

UNIT - IV

Transformations and Kinematics: Objectives, homogenous coordinates, basic transformation operations, forward solution - Denavit Hartenberg procedure. Simple problems involving planar manipulators, inverse or backward solution - problems involved, techniques. (15)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Robotic Engineering by Richard D.Klafter, Prentice-Hall of India Pvt Ltd, 2010.*
2. *Industrial Robotics by Mikell P. Groover, Tata McGraw-Hill Int. Edition 2, 2012.*

REFERENCE BOOKS:

1. *Introduction To Robotics: Mechanics And Control, John J. Craig 3rd edition, pearson, 2008.*
2. *Robotics: Control, Sensing, Vision, and Intelligence, K. S. Fu, R. C. Gonzales, and C. S. G. Lee, Tata McGraw-Hill, NY, 2008.*
3. *Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, Prentice Hall, NJ, 2010.*
4. *Robotics and control, R.K. Mittal, TMH, 2005.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/courses.php?branch=Mechanical*
2. *http://academicearth.org/courses/introduction-to-robotics*

VIDEO REFERENCES:

1. *http://nptel.iitm.ac.in/video.php?courseId=1052*

Elective -II (OPEN)

IV/IV Year B.Tech.-Seventh Semester

ME - 415/B OPERATIONS RESEARCH

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *Grasp the methodology of OR problem solving.*
- *Understand and differentiate deterministic/probabilistic/stochastic static/dynamic problem solving situations.*
- *Develop formulation skills in building models and finding solutions.*
- *Understand the basics in the field of and game theory*
- *Be able to interpret solutions on project planning through networks and simulation*

Learning outcomes:

- *Develop linear programming models that consider the key elements of the real world problem*
- *Interpret the models' solutions and infer solutions to the real-world problems.*
- *Recognize and solve transportation, game theory and dynamic programming problems.*
- *Know how project planning and when simulation can be applied to real-world problems.*

COURSE CONTENT :

UNIT I

Linear Programming : Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution. (15)

UNIT II

Transportation Problem: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model. (8)

Assignment Problem: One to one assignment problem, optimal solutions, unbalanced assignment matrix, travelling sales man problem, maximization in A.P.

UNIT III

Theory of Games: Introduction, rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, concept of dominance to reduce the given matrix, Graphical method for 2xn and nx2 games. [9]

Dynamic Programming: Introduction, Characteristics of D.P. model, the recursive equation approach, Computational Procedure in dynamic Programming, solution of an L.P. by D.P. [6]

UNIT IV

Project Planning through Networks: Introduction, Basic steps in PERT/ CPM techniques, Network diagram presentation, Rules of drawing network diagram, Fulkerson's rule, Time estimates and Critical path in network analysis, Project evaluation and review technique, Application areas of PERT/CPM techniques. [9]

Simulation: Introduction, Monte-Carlo Simulation, Application to Inventory Control, Application to Queuing Problems. [6]

LEARNING RESOURCES

TEXT BOOKS:

1. *SD Sharma, 'Operations Research (Units I,IV) Kedarnath, Ramnath & Co.,Meerut , 11th Edition , 2002..*
2. *BSGoel &S.K.Mithal,'Operations Research'(Units II,III) 'Pragathi Prakasham, Meerut, 2001.*

REFERENCE BOOKS :

1. *Optimization Theory and Applications - S.S. Rao , John Wiley & Sons , 1996.*
2. *Operations Research - Gupta and Hira , S Chand Publishers , 2011 Edition*

WEB REFERENCES:

- *http://www2.informs.org/Resources/*
- *http://www.mit.edu/~orc/*
- *http://www.ieor.columbia.edu/*
- *http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm*
- *http://www.wolfram.com/solutions/OperationsResearch/*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

CE - 415 /A FINITE ELEMENT METHOD

Lectures	*: 3 Periods/Week*	*Sessional marks*	*: 40*
Tutorials	*: 1 Period/Week*	*Semester End Exam. marks*	*: 60*
Semester End Exam.:	*3 Hours*	*Credits*	*: 3*

Course Objectives:

- *To introduce basic principles of solid mechanics and energy methods*
- *To explain the properties of one-dimensional and two-dimensional elements*
- *Evaluation of element stiffness matrix and nodal load vector*
- *Assemblage of element stiffness matrices and nodal load vectors to obtain global stiffness matrix and global load vector*
- *To solve the simultaneous equations of equilibrium*
- *Solution to one - and two- dimensional problems*
- *To extend the method to soil / rock mechanics and inviscid and incompressible fluid flows.*

Learning Outcomes:

- *Learn the basic principles of solid mechanics and energy methods*
- *Know the properties of one-and two- dimensional elements*
- *Can evaluate element stiffness matrices and element load vectors*
- *Can obtain global stiffness matrix and nodal load vector*
- *Able to solve the simultaneous equations of equilibrium*
- *Able to obtain solutions to one- and two-dimensional problems*
- *Able to apply the method to soil / rock mechanics and inviscid and incompressible fluid flows*

COURSE CONTENT :

UNIT -I (15)

The standard discrete system and origins of the finite element method Introduction ; The structural element and the structural system; Assembly and analysis of a structure ; The boundary conditions; Electrical and fluid networks ; The general pattern; The standard discrete system

A direct physical approach to problems in elasticity: plane stress Introduction ; Direct formulation of finite element characteristics; Generalisation to the whole region ; Displacement approach as a minimization of total potential energy; Convergence criteria; Finite element solution process; Numerical examples

UNIT -II (15)

Generalisation of the finite element concepts

Weighted residual methods - Integral or weak statements equivalent to the differential equations; Approximation to integral formulations; the Galerkin method ; Partial discretisation; Convergence Variational principles - What are variational principles ? ; Natural variational principles and their relation to governing differential equations ; Establishment of natural variational principles for linear , self-adjoint , differential equations ; Maximum, minimum or saddle point.

UNIT -III (15)

Standard and hierarchical element shape functions

Standard and hierarchical concepts; Rectangular elements - some preliminary considerations ; Completeness of polynomials ; Lagrange family ; Serendipity family Triangular element family ; Line elements Mapped elements and numerical integration

Use of shape functions in the establishment of coordinate transformations ; Geometrical conformity of elements; Variation of the unknown function within distorted, Curvilinear elements - continuity requirements; Evaluation of element matrices - transformation in local natural and area/volume coordinates; Order of convergence for mapped elements ; Numerical integration - One-dimensional and two-dimensional ; Required order of numerical integration

UNIT -IV (15)

Problems in linear elasticity

Governing equations; Finite element approximation; Displacements, strains and stresses; Numerical examples.

Field problems - Heat conduction, electric and magnetic potential and fluid flow.

General quasi-harmonic equation ; Finite element solution process ; Partial discretisation - transient problems ; Numerical examples - an assessment of accuracy.

LEARNING RESOURCES:

TEXT BOOK:

The finite element method - Its basis & Fundamentals by Zienkiewicz , Taylor and Zhu , 6th Edition, Elsevier India Private Ltd, 2007.

REFERENCE BOOKS:

1. *The finite element method in engineering by S. S.Rao, Butterworth-Heinemann, New Delhi, 1999.*
2. *Introduction to the finite element method by C.S. Desai and J.F.Abel, CBS Publishers and distributors, 1987.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

CE - 415/B REMOTE SENSING AND GIS

Lectures	*: 3 Periods/Week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 Period/Week*	*Semester End Exam. Marks*	*: 60*
Semester Exam .	*: 3 Hrs*	*Credits*	*: 3*

Course Objectives:

- *To develop the fundamental concepts of GIS and remote sensing including the electromagnetic Spectrum, and nature of geospatial data.*
- *To make the student to understand the various Civil engineering applications of remote sensing.*
- *To familiarize s the students in the GIS based analytical and problem solving techniques for Sustainable planning and management of civil Engineering projects.*

Learning Outcomes:

- Understand the importance of Remote sensing and GIS application in civil engineering
- Students are familiarize with study and identification of satellite imageries
- Students are able to learn the soft skills by using GIS technologies

COURSE CONTENT :

UNIT - I (15)

Introductions to remote sensing; Applications and importance of remote sensing, Basic concepts and fundamentals of remote sensing Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units, over view of Indian Remote sensing satellites and sensors.

UNIT - II (15)

Image Interpretation : Energy resources, energy interactions with earth surface features and atmosphere, resolution, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies.

Geographic Information System: Introduction, GIS definit]ion and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

UNIT - III (15)

Data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS - Advantages and disadvantages. File management, Spatial data - Layer based GIS, Feature based GIS mapping.

GIS Analysis : GIS Spatial Analysis Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT - IV (15)

Applications of GIS : Application areas and user segments; Guide lines for preparation of GIS; Applications of GIS for land use and housing management; Assessment of physical transformation in an urban area.

Water Resources Applications: Land use/Land cover in water resources, Surface water mapping and inventory, Watershed management for sustainable development. Reservoir sedimentation, Ground Water Targeting and Identification of sites for artificial Recharge structures.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Remote Sensing and its applications by LRA Narayana, University Press 1999.*
2. *Principals of Geo physical Information Systems - Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.*

REFERENCE BOOKS :

1. *Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yeung, Prentice Hall, 2002.*
2. *Text Book of Remote Sensing and Geographical Information systems by M.Anji Reddy , 4th Edition,B.S.Publications,2012.*
3. *Geographic information Systems by Kang- tsung Chang, McGraw-Hill,2003.*
4. *Basics of Remote sensing & GIS by S.Kumar, USP,2005.*

WEB REFERENCES:

1. *http://www.lib.vt.edu/subjects/maps/cartographic.html*
2. *http://blogs.esri.com/esri/gisedcom/2010/01/08/using-online-resources-to-teach-remote-sensing/*
3. *http://www.tec.army.mil/gis/*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

BT- 415/A BIOSENSORS & BIOELECTRONICS

Lectures	*: 3 Periods /week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 Period / Week*	*Semester Examination Marks*	*: 60*
Semester Examination: 3 hours		*No. of credits*	*: 3*

Course Objectives:

- *Understand what biosensors are, their advantages and limitations.*
- *Acquire knowledge of types and construction of Biosensors.*
- *Gain knowledge and understanding of various types of transducers, their principles and applications.*
- *Understand the construction and working of biosensors and their utilities in Industry, agriculture etc.*
- *Understand the advantages of potential biomolecular computer.*
- *Acquire knowledge and appreciate the development of molecular arrays as memory stores.*
- *Acquire knowledge of assembly of photonic biomolecular memory store.*
- *Understand and appreciate information processing and prospects for biomolecular computing systems.*

Learning Outcomes:

- *Gained understanding of biosensors, their advantages and limitations.*
- *Acquired knowledge of types and construction of Biosensors.*
- *Gained knowledge and understanding of various types of transducers, their principles and applications.*
- *Developed understanding of the construction and working of biosensors and their utilities in Industry, agriculture etc.*
- *Appreciates the advantages of potential biomolecular computer.*
- *Acquired knowledge of the development of molecular arrays as memory stores.*
- *Acquired knowledge of assembly of photonic biomolecular memory store.*
- *Developed understanding of information processing and prospects for biomolecular computing systems.*

COURSE CONTENT :

UNIT- I (15)

Introduction: Introduction to Biosensors, Advantages and Their Limitations, Various components; Biocatalysis based biosensors, Bioaffinity based biosensors and Microorganisms based biosensors; Biologically active material and analyte; Types of membranes used in biosensor constructions.

UNIT- II (15)

Transducers in Biosensors and Applications of Biosensors: Various types of transducers; Principles and applications- Colorimetric, Optical, Potentiometric, Amperometric, Conductometric, Resistometric, Piezoelectric, Semiconductor, Impedimetric, Mechanical and Molecular electronic based transducers. Chemiluminiscence based biosensors. Biosensors in clinical chemistry, medicine and health care; Biosensors for veterinary, agriculture and food; Low cost biosensors for industrial processes for online monitoring; Biosensors for environmental monitoring.

UNIT- III (15)

Molecular Electronics: Potential advantages and development towards a biomolecular computer; Development of Molecular arrays as a memory stores; Molecular wires and switches; Mechanisms of Unit assembly.

UNIT- IV (15)

Design for A Biomolecular Photonic Computer: Assembly of photonic Biomolecular memory store; Information Processing; Commercial prospects for Biomolecular computing systems.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Biotechnology the Science and Business, Moses V, Cape RE, Academic Publishers.*
2. *Biosensors for environmental Monitoring,Bilitewski U, Turner APF, Harwood.*
3. *Biosensors for Analytical Monitoring: EPA Biosensor Group, Rogers KR, Mascini M.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

BT - 415/B BIOMEDICAL INSTRUMENTATION

Lectures	*: 3 Periods /week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 Period / Week*	*Semester Examination Marks*	*: 60*
Semester Examination: 3 hours		*No. of credits*	*: 3*

Course Objectives:

- *Acquire knowledge of the basic anatomy and physiology of various organ systems of human body viz., circulatory, nervous, musculo-skeletal, respiratory, reproductive etc.*
- *Understand the homeostatic mechanisms of the body like maintenance of body temperature.*
- *Acquire knowledge and understanding of the principles underlying the design of diagnostic equipments like ECG,EEG, EMG etc.*
- *Understand the concepts of contact impedance and effects, electrodes used and their working.*
- *Understand the transducers - types and characteristics*
- *Understand the physiological pre-amplifier and specialized amplifiers.*
- *Acquire knowledge of the built and working of X-ray machines.*
- *Develop skills in troubleshooting and maintenance of X- ray machines.*

Learning Outcomes:

- *. Gained insight into the working of various organ systems of human body.*
- *Developed an understanding of homeostatic mechanisms of human body.*
- *Acquired understanding of the principles and their application in the design of diagnostic equipments.*
- *Developed knowledge of the concepts of contact impedance and working of electrodes.*
- *Gained knowledge of the transducers, their types and characteristics.*
- *Developed knowledge of amplifiers and their applications.*
- *Gained understanding of the working of X-ray machines.*
- *Developed skills in maintenance and repair of X-ray machines.*

COURSE CONTENT :

UNIT- I

Basic Anatomy and Physiology: Elementary ideas of cell structure, heart and circulatory system, Central nervous system, body temperature, musculo-skeletal system, Respiratory system, and reproductive system. (10)

UNIT- II

Bioelectric equipment and Bioelectric signals: Equipment - diagnostic, therapeutic and clinical laboratory; Bioelectric signals (ECG, EOG, EEG, EMG, ERG) and their characteristics; Bioelectrodes, electrodes at tissue interface, contact impedance, effects of high contact impedance, types of electrodes - Electrodes for ECG, EEG, EMG. (12)

UNIT- III

Transducers for Biomedical Applications: Resistive transducers - Muscle force and Stress (Strain gauge), Spirometry (Potentiont) humidity, (Gamstrers), Respiration (Thermistor), Inductive Transducers - Flow measurements, muscle movement (LVDT), Capacitive Transducers - Heart sound measurement; Photoelectric Transducers - Pulse transducers, Blood pressure, oxygen Analyses; Piezoelectric Transducers - Pulse pickup, ultrasonic blood flowmeter; Chemcial Transducer - Ag-Agfallas (Electrodes, PH electrode, Bioelectric Signal recording machines); Physiological pre-amplifier and specialized amplifiers, ECG lead systems details of ECG, EMG, and EEG machines. (16)

UNIT- IV

X-ray Machines and Safety aspects of Medical equipment: Basic X-Ray components and circuits, types of X-ray machines e.g. general purpose, dental image intensifier system; trouble shooting and maintenance of X- Ray machine; biological effects of X-rays and precautions. Gross current, Micro Current shock, safety standards and considerations, safety testing instruments. (8)

LEARNING RESOURCES

TEXT BOOKS:

1. *Medical Instrumentation by John. G. Webster -John Wiley*
2. *Principles of Applied Biomedical Instrumentation by Goddes& Baker - John Wiley*
3. *Biomedical Instrument by Cromwell-Prentice Hall of India, New Delhi*
4. *Hand book of Medical instruments by R.S. Khandpur -TMH, New Delhi*

REFERENCE BOOKS:

1. *Biomedical Instrumentation & Measurement by Carr & Brown-Pearson*
2. *Medical Electronics and Instrumentation by Sanjay Guha - University Publication*
3. *Introduction to Biomedical electronics by Edwand J. Bukstein - Sane and Co. Inc. USA*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

ChE - 415/A ENERGY ENGINEERING

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To provide the knowledge about formation, classification, ranking, analysis, testing, carbonization, gasification and liquification of coal, manufacture of cock.*
- *To provide the knowledge about design, occurrence, composition, classification, exploration and production of petroleum, refining, testing and analysis of petroleum products.*
- *To provide knowledge about the non conventional energy courses and its storage*
- *To provide knowledge about the energy related problems in the world and its solutions.*

Learning Outcomes:

- *An ability to understand the importance of environment and conservation of natural resources.*
- *An ability to succeed in the competitive exams of energy industry.*
- *An ability to utilize the non conventional energies in place of conventional energies and its manufacture.*
- *An ability to maintain the sustainability in the environment.*

COURSE CONTENT :

UNIT - I (15)

Conventional energy resources, the present scenario, scope for future development.

Coal: Origin, occurrence and reserves, classification, ranking, analysis and testing, coal carbonization, manufacture of coke, coal gasification, coal liquefaction.

UNIT - II (15)

Petroleum: Origin, occurrence and reserves, composition, classification, characteristics, exploration and production.

Petroleum Refining: Refinery processes, petroleum products, testing and analysis of petroleum products.

UNIT - III (15)

Non conventional energy sources: Solar energy, solar radiation, principles of heating and cooling, photo voltaic cells.

Bio gas products, bio-mass, wind energy, hydrogen energy, geothermal and ocean thermal energy, fuel cells.

UNIT - IV (15)

Energy storage, mechanical energy storage, water storage, solar pond, phase change storage, chemical storage.

Energy Conservation: Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Conventional Energy technology by S.B.Pandy, Tata McGraw Hill (1987)*
2. *Fuel Science by Harker and Allen,Ist edition , Oliver & Boyd (1972).*
3. *Principles of Energy conversion by Culp, Mc Graw Hill(1991)*

REFERENCE BOOKS:

1. *Hand book of Energy Technology by Considine D. M,McGraw Hill(1977).*
2. *Fuels and energy by Harker and Backhusst, Academic press (1981)*
3. *Solar Energy Thermal Process by John A Duffie, John Wiley & Sons Inc (1975).*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

ChE - 415/B BIOFUELS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To provide the knowledge about properties, composition, features of biofuels and uses of biomass and their environmental impacts.*
- *To provide the students a substantial knowledge of biofuel production technologies.*
- *To provide knowledge about the process of biogas production and methods of production of biodiesel and comparison of the standards to the conventional diesel.*
- *To provide knowledge about the production of lipids, bio hydrogen from different bacteria and algae.*

Learning Outcomes:

- *An ability to describe the functional principle of biofuel technologies in small and large scale.*
- *An ability to describe the main steps and components in bioethanol, biodiesel and biogas production.*
- *An ability to Participate actively in teamwork and work with case related problem solving.*
- *An ability to work with professional problem solving in an industrial environment.*

COURSE CONTENT :

UNIT - I (15)

Introduction:

Sources of energy, introduction of biofuels, availability of bio mass, composition of biomass, terrestrial biomass, aquatic biomass.Physical and chemical properties of biomass.useful features of biofuels,

undesirable features of biofuels, energy crops, modes of utilization of biomass and their environmental impacts.

UNIT - II (15)

Biogas: The substrate, the digester, the microorganisms, the process of bio gas production, factors affecting bio gas yields, advantages, disadvantages.

Bioethanol : Bioethanol vs. Petrol, production of bio ethanol, ethanol recovery.Bio butanol.

UNIT -III (15)

Bio diesel: Sources of lipids, production of lipids, methods of production of bio diesel, comparison of bio diesel with conventional diesel.Standards of bio diesel.

UNIT - IV (15)

Bio hydrogen: Production of bio hydrogen from anaerobic bacteria, photosynthetic algae, photosynthetic-hydrogenase system.

Fuel cells: Enzymatic fuel cells, microbial fuel cells.

LEARNING RESOURCES:

TEXT BOOK:

1. *Bio Technology - Expanding horizons, B.D.Sing, Kalyani Publishers, Ludhiana.*

REFERENCE BOOKS:

1. *Fundamentals of Renewable Energy Systems, D.Mukherjee, S.Chakrabarti, New Age International Publishers.*
2. *A Text Book of Biotechnology, R.C.Dubey, S.Chand & Company Ltd., New Delhi.*
3. *Non-Conventional Energy Sources, G.D.Rai, Khanna Publishers.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

CS -415/A JAVA PROGRAMMING

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration	*: 3 hours*	*Credits*	*: 3*

Course Objectives:

- *Understand the syntax of the java and Write simple Java applications using control statements like if, if-else etc..*
- *Understand Object oriented Programming Principles like encapsulation, inheritance, and polymorphism in java.*
- *Understand how to use classes, methods and objects.*
- *Learn inheritance, Interfaces and packages.*
- *Manipulate the String & StringBuffer, Date, Collection, Enumeration, and Wrapper classes.*
- *Understand the exception handling mechanism in java.*
- *Understand the Threading mechanism in java and creating multiple threads, demonstrate the deadlock situation and inter thread communication.*
- *Under stands the I/O streams in java and use the classes Streams, Byte streams, Character streams, File class, File stream.*
- *Understand and implement Applets and use Graphics class.*
- *Understand the event handling mechanism & difference between AWT and Swing components.*
- *Understand the concept of database connectivity and write database applications with java.*
- *Understand the concept of java basic networking principles.*

Learning Outcomes:

- *Familiar the syntaxes and semantics of java programming language.*
- *Understanding the concepts of OOPs; create new classes, methods, objects.*

- *Study the predefined packages, and define user defined packages and Interfaces.*
- *Implement the String and String Buffer, Date, Enumerations, and wrapper classes.*
- *Define own exception classes that may be needed in the application development.*
- *Write multitasking applications with threads and able to detect deadlock situations.*
- *Develop applets for internet applications*
- *Develop applications that are based on event driven programming.*
- *Design more efficient GUI applications with java.awt.*
- *Develop GUI applications with javax.swing. Packages.*
- *Ability to develop the Database Applications with java.sql.*
- *Design Networking applications such TCP and UDP with java.net.*

COURSE CONTENT :

UNIT-I (16)

Introduction: Introduction to java, java buzzword, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

UNIT-II (14)

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

UNIT-III (15)

Strings: Exploring the String class, String buffer class, Command-line arguments.

Library: Date class, Wrapper classes.

Multithreading : Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks.

I/O Streams: Streams, Byte streams, Character streams, File class, File streams.

UNIT-IV (15)

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.

LEARNING RESOURCES:

TEXT BOOK:

1. *The Complete Reference Java J2SE 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.*

REFERENCE BOOKS :

1. *Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons,Pearson Edu.(UNIT-IV)*
2. *Beginning in Java 2, Iver Horton, Wrox Publications.*
3. *Java, Somasundaram, Jaico.*
4. *Introduction to Java programming, By Y.Daniel Liang,Pearson Publication*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

CS - 415/B DATABASE MANAGEMENT SYSTEMS

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration : 3 hours		*Credits*	*: 3*

Course Objectives:

- *To understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of Databases.*
- *To understand the structural constraints of relationships*
- *To understand the types of integrity constraints in a relational database system.*
- *To understand the concepts provided by Relational Algebra, Relational Calculus and SQL and able to specify queries on any database using them.*
- *To recognize the importance of data base analysis and design in the implementation of any database application.*
- *To understand how to perform the normalization process of relations before implementation.*
- *To understand the primary file organizations and index structures used by different database systems.*
- *To describe the role of transaction processing in a database system*
- *To understand various concurrency control mechanisms for a database system*
- *To describe the roles of recovery and security in a database system.*

Learning Outcomes:

- *An understanding of basic concepts and current trends of different database systems*
- *An understanding of various database system architectures*
- *An ability to enforce various integrity constraints*

- *An ability to write relational algebra and Relational calculus expressions*
- *An ability to use Standard Query Language and its various versions.*
- *An ability to design and develop a database that is in specified normal form.*
- *An understanding of the Importance of transaction processing*
- *An ability to use different concurrency control techniques while implementing real time applications*
- *An understanding of the importance of backup and recovery techniques.*
- *An ability to build Database systems that can handle real world problems.*

COURSE CONTENT :

UNIT-I

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types (15)

UNIT-II

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations - Relational Database Design Using ER-to-Relational Mapping

SQL-99 : Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema

Change Statements in SQL - Basic Queries in SQL - More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL (15)

UNIT-III

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form Database Security: Introduction to Database Security Issues - Discretionary Access Control Based on Granting and Revoking Privileges - Mandatory Access Control. (15)

UNIT-IV

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering

Database Recovery Techniques: Recovery Concepts - Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging (15)

LEARNING RESOURCES:

TEXT BOOK:

1. *Fundamentals of Database Systems, Ramez Elmasri and Navate, Pearson Education, 5th edition.*

REFERENCE BOOKS:

1. *Introduction to Database Systems, C.J.Date, Pearson Education.*
2. *Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition*
3. *Data base System Concepts, Silberschatz, Korth, McGraw hill, 5th edition.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

EC - 415/A APPLIED ELECTRONICS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*University Exam Marks*	*: 60*
University Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To Understand about various modern electronic systems.*
- *To provide clear explanation of the operation of all the important electronic devices and systems available.*
- *To know about modern audio and video systems.*
- *To knoew about various Telecommunication Systems.*

Learning Outcomes:

- *To Know about various electronic gadgets and their operation.*
- *Can be able to design various equipment used in the electronic systems.*

COURSE CONTENT :

UNIT -I (Text Book1)

Microphones, Headphones and Headsets, Loud Speakers, Disc Recording and Reproduction , Amplifying Systems Equalizers and Mixers, Electronic Music Synthesizers. (15)

UNIT-II (Text Book1)

Commercial Sound, Theatre Sound System, Audio Systems , Color TV standards and Systems, Remote Controls, Video Systems. (15)

UNIT-III (Text Book1)

Electronic Gadgets and Home Appliances:

Telecommunication Systems, Switching Systems, Modulation Techniques, Carrier Systems, Fibre Optics (15)

UNIT-IV (Text Book1)

Data Services, Mobile Systems, Facsimile fax, Xerography (15)

LEARNING RESOURCES:

TEXT BOOK:

1. *Consumer Electronics by S.P.Bali, Pearson Education, ISBN: 9788131717592.*

REFERENCE BOOKS:

1. *Consumer Electronics for Engineers by Philip Herbert Hoff, Cambridge University Press (July 28, 1998), ISBN-10: 0521582075*
2. *Digital Consumer Electronics Handbook by Ronald K.Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. ISBN-10: 0070341435*

WEB REFERENCES:

1. *http://www.newagepublishers.com/samplechapter/000969.pdf*
2. *http://www.bits-pilani.ac.in:12354/qp1-9-10/EEE_C414_851_C_2009_1.pdf*
   3.http://nptel.iitm.ac.in

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

EC - 415/B BASIC COMMUNICATION

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*University Exam Marks*	*: 60*
University Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To Understand an overview of communication systems.*
- *To Understand the modulation technique,need of modulation,Amplitude modulation.*
- *To understand fundamentals of digital communications*
- *To understand broadband communication systems and Television fundamentals.*

Course Outcomes:

- *Can decide the type of modulation techniques required for a specific application.*
- *Can know about various communication systems.*
- *Can know about the Television fundamentals.*

COURSE CONTENT :

UNIT -I [Text Book 1]

Communications: Communications systems, Information, Transmitter, Channel - noise, Receiver, Modulation, Description, Need for modulation, Bandwidth Requirements, Frequency spectra of nonsinusoidal waves.

Amplitude Modulation: Amplitude Modulation Theory, Frequency spectrum of the AM wave, Representation of AM, Power relations in the AM wave, Generation of AM, Basic requirements - comparison of levels, Grid - modulated class C amplifier, Plat - modulated class C amplifier, Modulated transistor amplifiers, System summary. (15)

UNIT -II [Text Book 1]

Digital Communications: Digital Technology, Digital fundamentals, The binary number system, Digital electronics, Fundamentals of Data

Communications Systems, The emergence of data communications systems, Characteristics of data transmission circuits, Digital codes, error detection and correction, Data Sets and Interconnection Requirements, Modem classification, Modem interfacing, Interconnection of data circuits to telephone loops, Network and Control Considerations, Network organization, Switching systems, network protocols, Summary. (15)

UNIT -III (Text Book 1)

Broadband Communications Systems: Multiplexing, Frequency division multiplex, Time - division multiplex, Short and Medium - Haul Systems, Coaxial Cables, Fiber optic links, Microwave links, tropospheric Scatter links, Long Haul Systems, Submarine cables, Satellite Communications, Elements of Long-Distance Telephony, Routing codes and signaling systems, Telephone exchanges (switches) and routing, Miscellaneous practical aspects, Introduction to traffic engineering.(15)

UNIT -IV (Text Book 1)

Television Fundamentals : Requirements and Standards, Introduction to television, Television systems and standards, Black and White Transmission, fundamentals, Scanning, Banking and synchronizing pulses, Black and white Reception, Fundamentals, Common, video and sound circuits, Synchronizing circuits, Vertical deflection circuits, Horizontal deflection circuits, Color Transmission and Reception, Introduction, Color transmission, Color reception. (15)

LEARNING RESOURCES:

TEXT BOOK:

1. George Kennedy, Tata McGraw-Hill Publishing , 3rd Edition

REFERENCE BOOK:

1. Introduction to Analog and Digital Communication, Simon Hykin S

WEB REFERENCES:

1. *http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm*
2. *http://www.ensc.sfu.ca/~jiel/courses/327/index.html*
3. *http://www.ece.utah.edu/~npatwari/ece5520/lectureAll.pdf*
4. *http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=117105077*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

IT- 415/A WEB TECHNOLOGIES

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration :3 hours		*Credits*	*: 3*

Course Objectives:

- *Describe the basic infrastructure and architecture of the Internet, including the main protocols.*
- *Write a valid XHTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.*
- *Use CSS to implement a variety of presentation effects in XHTML and XML documents, including explicit positioning of elements*
- *Understand the need of scripting language, accessing XHTML elements using DOM, dynamic styles, validating user inputs, events for user interactions.*
- *Understand the need of XML documents, XML DTDs differ from XML schemas, discuss ways in which an XSL transform differs from processing an XML document using a DOM API.*

Learning Outcomes:

After completion of the course, student posses:

- *Understands the basic infrastructure and architecture of the Internet, including the main protocols.*
- *Ability to create static XHTML web pages and to apply style sheets for uniform look and feel for web pages using CSS.*
- *Ability to write client side scripting using JavaScript, understand how to construct programs modularly with functions, concept of arrays, and understand the object-based programming terminology.*
- *Ability to use scripting for creation of dynamic web pages, accessing elements using DOM, user interactions with events.*
- *Ability to create valid XML documents using DTDs & XML Schemas, providing styles to XML documents using XSL, and understand the importance of RSS feeds in the modern web.*

COURSE CONTENT :

UNIT- I (13)

Fundamentals: A Brief introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The HTTP.

Introduction to XHTML: Origins and evolution of HTML, and XHTML, Basic Syntax, Standard XHTML, Document structures, Basic Text markup, images, hypertext links, lists, tables, forms, frames, syntactic differences between HTML & XHTML.

UNIT - II (17)

Cascading Style Sheets (CSS): introduction, levels of style sheets, style specification formats, selector forms, property value forms, font properties, list properties, color, alignment text, The Box model, Background images, the span and div tags.

The Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, General Syntactic characteristics, primitives, operations and expressions, Screen output and keyboard input, control statements.

UNIT - III (15)

JavaScript : Object creation and modification, Arrays, Functions, An Example, Constructors, Pattern matching using regular expressions, Errors in scripts.

JavaScript and HTML Documents: The JavaScript Execution Environment, The Document Object Model, Element accessing in JavaScript, Events and Event Handling, Handling Events from Body elements, Handling events from Button elements, Handling Events from Text boxes and password elements, The DOM 2 Event model, The Navigator object.

UNIT - IV (15)

Dynamic Documents with JavaScript: Introduction, Element Passing, Moving Elements, Element Visibility, Changing colors and Fonts, Dynamic Content, Stacking Elements, Locating the mouse cursor, Reacting to mouse click, slow movement of elements, dragging and dropping elements.

Introduction to XML: Introduction, The syntax of XML, XML document structure, Document Type Definition, Namespaces, XML Schemas,

Displaying Raw XML documents, displaying XML documents with CSS, XSLT Style sheets.

LEARNING RESOURCES:

TEXT BOOK:

1. *Robert W. Sebesta "Programming the World Wide Web", 4/e Pearson Education.*

REFERENCE BOOKS:

1. *Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 5/e, Pearson Education.*
2. *Jeffrey C. Jackson "Web Technologies A computer Science Perspective" Pearson Education.*
3. *Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", "Pearson Education.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

Elective -II (OPEN)

IV/IV Year B.Tech.- Seventh Semester

IT - 415/B SOFTWARE ENGINEERING

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration : 3 hours		*Credits*	*: 3*

Course Objectives:

- *To make the students learn about the basic concepts on Software Engineering Methods and Practices and their appropriate application in Software industry.*
- *To develop an understanding of Software Process Models and Software Development Life Cycle.*
- *To provide an idea on Software testing techniques.*
- *To teach an understanding role of the different aspects of Software Project Management.*
- *To develope an approach on ethical and professional issues those are important for software Project Management.*

Learning Outcomes:

- *Capabilities to identify, formulate, and solve Software Engineering problems.*
- *Be able to elicit, analyze and specify software requirements with various stakeholders of a software development project.*
- *Ability to participate in design, development, deployment and maintenance of a medium scale software development project.*
- *Knowledge to convey technical material through oral presentation and interaction with an audience.*
- *Ability to evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of models, tools, and techniques.*

COURSE CONTENT :

UNIT - I (15)

Introduction to Software Engineering: The Evolving Role of Software, the Changing Nature of Software, Legacy Software.

A Generic View of Process : A Layered Technology, A Process Framework.

Process Models : The Waterfall Model, Incremental Process Models, Evolutionary Models

An Agile View of Process : What is Agility? What is an Agile Process?

UNIT - II (20)

Software Engineering Practice: Software Engineering Practice, Communication Practices, Planning Practices, Modeling Practices, Construction Practice, Deployment.

System Engineering: Computer Based Systems, The System Engineering Hierarchy, Business Process Engineering: an overview, Product Engineering: an overview.

Requirements Engineering: Requirements Engineering Tasks, Initiating the Requirements Engineering Process.

UNIT - III (15)

Building the Analysis Model: Requirements Analysis, Analysis Modeling Approaches, Data Modeling Concepts, Flow-Oriented Modeling, Class Based Modeling.

Design Engineering: Design within the Context of Software Engineering, Design Process and Design Quality, Design Concepts.

UNIT - IV (15)

Software Quality Assurance: Quality Concepts, Quality Movement.

Testing Tactics : Software Testing Fundamentals, Black-Box Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, OO Testing Methods.

LEARNING RESOURCES:

TEXT BOOK :

1. *Roger S.Pressman, 'Software Engineering- A Practitioner's Approach', Sixth Edition, McGraw- Hill International.*

REFERENCE BOOKS:

1. *Ian Sommerville, 'Software Engineering', Sixth Edition, Pearson Education.*
2. *Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, 'Fundamentals of Software Engineering', Second Edition, PHI.*
3. *Rajib Mall, 'Fundamentals of Software Engineering', Second Edition, PHI.*

IV/IV Year B.Tech.-Seventh Semester

EE - 416/A HVDC TRANSMISSION

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- To know the advantages of HVDC transmission system for bulk power transmission ; to know HVDC projects in India and major projects in abroad.
- To make the student to learn about application of DC transmission system and modern trends in DC transmission.
- To describe HVDC converter stations, schematic, protection schemes, control strategies, HVDC simulator.
- To give an idea about converter faults and protection against over voltages.
- To know the modeling of HVDC systems, modeling equations, AC/DC load flow equations.
- To design filter circuits to suit with HVDC systems.

Learning outcomes:

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

- Will have a wide idea on practical applications of HVDC transmission converter stations and their control, harmonics generated and design of filter circuits.
- Latest trends in transmission networks for bulk power transfer and power quality improvement.
- Will have an idea of HVDC projects present in India/world wide.
- Will have an idea about HVDC simulator and principles of DC link control.
- Prepare for competitive exams in this course.

COURSE CONTENT:

UNIT-I [Reference book-1&Texkbook-1]

General considerations of AC and DC transmission: Introduction - economic advantages of DC over AC transmission - types of DC links

- brief description of the layout of a bipolar HVDC link - technical advantages of DC over AC transmission - application of DC transmission system - planning and modern trends in DC transmission - brief summary of the technical details of HVDC projects in India. (8)

UNIT-II [Reference book-1&Texkbook-1]

Converter Circuits: Properties of converter circuits - different kinds of arrangements - choice of converter configuration analysis of bridge converters with grid control with and without overlap angle -complete characteristics of 6 pulse and 12 pulse converters - operation as an inverter - converter parameters and characteristics - values of transformer secondary currents - converter equations.

Protection: Converter faults - short circuit current - arc back currents - short circuit currents in rectifier and inverter - protection against over currents - DC smoothing reactors,- bypass valves - DC circuit breakers. protection against over voltages - surge arresters. (14)

UNIT-III [Reference book-1&Texkbook-1]

Converter and HVDC system Control: Principles of DC link control - converter control characteristics - firing angle control - current and extinction angle control - effect of source inductance - starting and stopping of DC link - the four operating modes of the DC link - CG, AC, AG, CV - power control - sources of reactive power - reactive power requirements in steady state - reactive power control. Introduction to HVDC simulator. (11)

UNIT-IV [Reference book-1&Texkbook-1]

Power Flow Analysis in AC/DC systems: Modeling of DC links - solution of DC load flow

Harmonics and Filters: Generation of harmonics - characteristic and uncharacteristic harmonics - adverse effects of harmonics - calculation of voltage and current harmonics. The impedance loci; Methods of reducing the harmonics - AC tuned and high pass filters - DC filters - telephonic interference. (13)

LEARNING RESOURCES:

T*EXT BOOKS:*

1. HVDC power transmissions systems: Technology and system interactions by K.R. Padiyar New age International (P) Ltd.

2. HVDC transmission by J. Arrillaga, Peter Peregrinus.

REFERENCE BOOKS:

1. Direct Current transmission by E.W.Kimbark, John Wiley.

2. Power Transmission by Direct Current by E.Uhlmann, Springer-Verlag.

3. HVDC power converters and systems by B.J.Cory and Mc Donald.

4. EHVAC and HVDC transmission engineering and practice by S. Rao.

5. HVDC transmission by Adamson and Hingorani.

WEB REFERENCES:

1. *www2.internetcad.com/pub/energy/techn*
2. *www.ieee.org/portal/cms_docs_pes/pes*
3. *www.allinterview.com/showanswers/7613*
4. *www.goodnewsindia.com/index.php/Suppl*
5. www.siemens.com/hvdc %Reference of whole HVDC system Power Transmission and distribution High voltage division in Germany

IV/IV Year B.Tech.-Seventh Semester

EE- 416/B ELECTRICAL DISTRIBUTION SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide sufficient theoretical and analytical background to understand the concepts of electric distribution system at various voltage levels.*
- *To make the student to learn the distribution system planning, automation, design of sub transmission lines and distribution substation.*
- *To develop skills for applying them in future on various engineering applications.*
- *To teach the analysis and design of primary and secondary systems.*
- *To give an idea on calculation of voltage drops, power losses.*

Learning outcomes:

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

- *Understand the concepts of distribution system Planning.*
- *Assess the design of new distribution system Planning.*
- *Design simple distribution system, sub transmission lines, primary feeder and Secondary feeders.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications.*
- *Peruse courses like new distribution system, sub transmission lines, primary feeder and Secondary feeders design.*
- *Get solutions for problems related to voltage drop and power loss calculations*

COURSE CONTENT :.

UNIT - I [Text Book - 1]

Distribution systems planning and automation: Planning and forecast techniques - Present and future role of computers in distribution system planning -automation - Methods of improvement - Load characteristics - Definitions load growth - tariffs. (15)

UNIT - II [Text Book - 1]

Distribution transformers: Types - Regulation and Efficiency - Use of monograms for obtaining efficiency - distribution factors - KW KVA Method of determining regulation.

Deign of sub transmission lines and distribution substations: Introduction - sub transmission systems - distribution substation - Substation bus schemes - description and comparison of switching schemes - substation location and rating - Application of network flow techniques in rural distribution networks to determine optimum location of sub-station. (15)

UNIT - III [Text Book - 1]

Design considerations on primary systems: Introduction - types of feeders - voltage levels - Radial type feeders - feeders with uniformly distributed load and non-uniformly distributed loads.

Design considerations of secondary systems: Introduction - secondary voltage levels - Secondary banking - existing systems improvement.

Distribution system Protection: Basic definitions - over current protection devices - fuses, automatic circuit reclosures, automatic line sectionalizers - objectives of distribution system protection - coordination of protective devices - Fuse to Fuse co-ordination, Fuse to circuit breaker coordination, Reclosure to circuit breaker co-ordination. (15)

UNIT-IV [Text Book - 1]

Voltage drop and power loss calculations: Three phase primary lines - non 3 phase primary lines - 4 wire multi grounded primary lines - copper loss - Distribution feeder costs - loss reduction and voltage improvement in rural distribution networks.

Applications of Capacitors to distribution systems: Effect of series and shunt capacitors - Power factor correction - economic justification for capacitors - a computerized method to determine the economic power factor - Procedure to determine the best and optimum capacitor location

Distribution System Voltage Regulation: Basic definitions - Quality of service - voltage control - line drop compensation. (15)

LEARNING RESOURCES

T*EXT BOOKS:*

1 *Electric Power Distribution System Engineering. By Turan Gonen, MGH.*

2. *Electrical Distribution Systems by Dr. V. Kamaraju, Right Publishers.*

3. *Electrical Power Distribution Automation by Sivanagaraju & Sankar, Dhanpatrai & Sons.*

REFERENCE BOOK:

1. Electric Power Distribution by A.S. Pabla, TMH, 4th Ed., 1997.

WEB RESOURCES:

1. *http://en.wikipediic.org/wiki/Electric-power-distribution*
2. *http://all-shares.com/download/g529889 Electric-power-distribution - systems.pdf.html*
3. *http://electricalengineeringtour.blogspot.com/2011/o1/free-download electric-distribution .html*

IV/IV Year B.Tech.-Seventh Semester

EE - 416/C COMPUTER ORGANIZATION

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 4*

Course Objectives:

- *To understand the basic organization of modern computer systems.*
- *To interpret how computer programs are organized, stored, and executed at the machine level.*
- *To analyze an instruction-set architecture and propose a suitable datapath and control unit implementation.*
- *To understand how instruction pipelining enhances processor performance.*
- *To understand the input/output mechanisms used to connect computers to their external environments.*
- *To learn the concepts of memory hierarchy and do operations with various types of memories.*

Learning outcomes:

- *An ability to analyze system performance at an overall level based on throughput and response time.*
- *A capability to make computer architecture design decisions based on measures such as cycles-per-instruction and instructions-per-cycle.*
- *An ability to understand memory hierarchy both with respect to physical organization and virtual memory as provided in modern operating systems.*
- *An ability to use binary and hexadecimal number systems.*
- *Knowledge of implementing fast integer multiplication methods such as Booth's algorithm.*
- *Detailed knowledge of floating point representation and arithmetic, including discussion of rounding and precision errors.*
- *An Understanding of design and implementation of single-cycle, multi-cycle, pipelined, and super-scalar architectures.*

COURSE CONTENT :

UNIT - I [Text Book - 1]

Register Transfer And Microoperations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Micro operations, Shift Micro operations, Arithmetic logic shift unit (13)

Basic Computer Organisation And Design: Instruction codes, Computer Registers, Computer Instructions, Timing and control, Instruction cycle, Memory-Reference Instruction, Input-output and Interrupt, Design of basic computer, Design of accumulator logic.

UNIT - II [Text Book - 1]

Micro Programmed Control: Control Memory, Address Sequencing, Micro program example, design of control unit. (17)

Central Processing Unit : General register organization, stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Reduced Instruction set computer (RISC).

Pipe Line And Vector Processing: Parallel processing, pipelining, Arithmetic pipeline, RISC pipeline, vector processing, Array Processing.

UNIT - III [Text Book - 1]

Computer Arithmetic: Addition and Subtraction, multiplication Algorithms, Division Algorithms, Floating-point Arithmetic operations. (15)

Input -Output Operations : Peripheral Devices, Input-output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor, Serial communication.

UNIT - IV [Text Book - 1]

Memory Organisation: Memory hierarchy, Main memory, Auxiliary memory, Associate Memory, Virtual Memory, Memory management hardware. (15)

Multiprocessors: Characteristics of multiprocessors, Interconnection Structures, InterprocessorArbitation, Interprocessor communication and synchronization, cache coherence.

COURSE CONTENT :

TEXT BOOKS:

1. *Computer systems Architecture - by Morris Mano (Chapters: 4,5,7 to 13) (3rd edition).*

REFERENCE BOOKS:

1. *Computer Architecture and organisation - by John P Hayes (2nd Ed.)*
2. *Computer Organization - by V. Carl Hamacher et.al. (2nd ed.)*

WEB REFERENCES:

1. *http://prezi.com/swvy4dq3jzyb/comorla-basic-structure-of-computer-hardware-and-software/%Basic structure of computers*
2. *http://publib.boulder.ibm.com/infocenter/iseries/v5r3/index.jsp?topic=%2Fapis%2FMIintro.htm %Machine interface instructions*
3. *https://www.classle.net/large-content/hardwired-control-vs-microprogram %Hardwired Control Vs Microprogram*
4. *https://www.classle.net/node/23942 % Superscalar Operation*
5. *http://www.eecg.toronto.edu/~moshovos/ACA05/004-pipelining.pdf Overview of pipelining*

IV/IV Year B.Tech.-Seventh Semester

EE- 416/D COMPUTER NETWORKS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To describe the uses of networks, network interfaces and different types of networks.*
- *To analyze and evaluate the network reference model suitable for any organization.*
- *To identify protocol stack and design Issues for the Layers.*
- *To identify requirements needed to design a computer network*
- *To interpret optimal routing algorithms for routing the packets on the network.*
- *To define Quality of service measures for any network.*
- *To demonstrate different congestion detection and control mechanisms.*

Learning outcomes:

- *Ability to analyze and determine the requirements and appropriate protocols for developing a network.*
- *Ability to designs a network architecture considering interfaces, services and protocols.*
- *Ability to apply contemporary issues in networking technologies for various applications.*
- *Ability to narrate the congestion control algorithms required for eliminating data losses in the network.*
- *Ability to implement various routing algorithms like distance vector routing, flooding and Shortest Path.*
- *Ability to differentiate connection oriented and connection less services of networks.*
- *Ability to use network protocols for various applications like file transfer, remote login etc.*

- *Ability to demonstrate multimedia applications like VOIP, Video Compression, Video on Demand etc.*

COURSE CONTENT:

UNIT - I [Text Book - 1]

Introduction: Uses of Computer networks, Network Hardware, Network Software, Reference Models (OSI and TCP/IP only).

Physical Layer: Introduction to Guided Transmission Media, Wireless Transmission. (12)

UNIT - II [Text Book - 1]

Data Link Layer: Data Link Layer design issues, Error detection and correction, Elementary Data link Protocols, Sliding window protocols.

Medium Access Control Sub layer: The channel Allocation problem, Multiple Access Protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth, Data Link Layer Switching. (15)

UNT - III [Text Book - 1]

Network Layer: Network layer Design Issues, Routing Algorithms - (The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts.) (17)

Congestion Control Algorithms, Quality of Service - (Requirements, Techniques for Achieving Good Quality of Service), Internetworking, The Network layer in the internet- (The IP Protocol, IP Address, Internet Control Protocols, OSPF, BGP).

UNIT - IV [Text Book - 1]

Transport Layer: Elements of Transport Protocols, TCP, UDP,RTP.

Application Layer: DNS, Electronic Mail, The World Wide Web (Architectural Overview only) Multimedia. (16)

LEARNING RESOURCES:

TEXT BOOKS:

1. *A.S Tanenbaum, Computer Networks, 4th Edition, PHI, 2003.*
2. *Behrouz A. Foruzan, Data communication and Networking, 4thEdition,TMH, 2004.*

WEB REFERENCES

1. *Wireshark Packet Analyzer (http://www.wireshark.org/)*
2. *Computer Networks on Wikipedia (http://en.wikipedia.org/wiki/Computer_network)*
3. *RFCs - Request For Comments (http://www.rfc-editor.org/rfc-index2.html)*
4. *Novell Networking Primer (http://www.novell.com/info/primer/primer.html)*
5. *Internet Videos*
   a. *History of the Internet (www.youtube.com/watch?v=9hIQjrMHTv4)*
   b. *BGP at 18: Lessons in Protocol Design (www.youtube.com/watch?v=HAOVNYSnL7k)*

IV/IV Year B.Tech.-Seventh Semester

EE -416/E POWER PLANT INSTRUMENTATION

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To give an overview of different equipment used in power generation systems.*
- *To furnish knowledge on Instrumentation and control of different circuits in steam power plant.*
- *To provide information on Supervisory control system of power plant operation.*

Learning outcomes:

Upon completion of the course the student attains familiarity with

- *Different equipment used in Power plants along with their control schematics.*
- *Control loops of different circuit schemes.*
- *Computer based power plant control.*

COURSE CONTENT :

UNIT - I: [Text Book - 1]

Importance of Instrumentation and control in Power generation: Classification of Instruments in power plant - Objectives of Instrumentation and control - Piping and instrumentation diagram - Cogeneration of power - Control rooms. (9)

UNIT - II: [Text Book - 1]

Instrumentation and control in water circuit: Water circuit - Boiler feed water circulation - Measurements in water circuit - Controls in water circuit - Impurities in water and steam.

Turbine monitoring and control: Introduction - Turbine steam inlet system -Measurements-Control system-Coolingsystem. (13)

UNIT - III: [Text Book - 1]

Instrumentation and control in Air-Fuel circuit: Air-Fuel circuit - Measurements - Control - Analytical measurements (8)

UNIT - IV: [Text Book - 1]

Power Plant Management: Master control - Combustion process - Boiler efficiency - Maintenance of measuring instruments - Intrinsic and electrical safety - Interlocks for boiler operation - Computer based control and data logging systems - Distributed control system (13)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Power plant instrumentation - K. Krishnaswamy , M. Ponni Bala, First edition, PHI, 2011.*
2. *Power Plant technology - MML Wakil TMH Publishing company Ltd., New Delhi.*

REFERENCE BOOKS:

1. *Elements of Electrical power station design - M.V. Deshpande, Wheeler Publishing Co.*
2. *Power-plant control and instrumentation : The control of boilers and HSRG systems, David Lindsey, IEE control engineering series, 58, 2000.*

WEB RESOURCES:

1. *www.siemens.co.in % For information on Instrumentation of power plant*
2. *http://www.niceindia.com/qbank/POWER_PLANT_INSTRUMENTATION_EI1002_.pdf % for model questions*
3. *http://www-pub.iaea.org/MTCD/publications/PDF/TRS387_scr.pdf % Guide book for control and instrumentation of nuclear power plant*
4. *www.abb.com % Overview of Electrical Instrumentation and control equipment in power plants*

IV/IV Year B.Tech.-Seventh Semester

EE -451 POWER ELECTRONICS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 2*

Course Objectives:

- *To make the students to design triggering circuits of SCR.*
- *To introduce power electronics components from which the characteristics of SCR, TRIAC, IGBT and MOSFET are obtained.*
- *To perform the experiments on various converters.*

Learning outcomes:

- *Acquire knowledge on various power electronic devices.*
- *Knowledge on various power electronic converters, design and applications.*
- *Able to design required drive circuits for project work.*

LIST OF EXPERIMENTS:

1. Static characteristics of SCR, Triac.
2. Characteristics of MOSFET & IGBT.
3. Gate triggering methods for SCR's (R, R-C, UJT).
4. Single phase fully controlled rectifier with R, RL & RLE load. (with or without feedback diode)
5. Characteristics of Jone's chopper.
6. Voltage commutated DC chopper
7. Characteristics of single - phase modified series inverter.
8. Characteristics of single - phase parallel inverter with R & RL loads.
9. Characteristics of single - phase Cyclo-converter. (Center tapped or Bridge)
10. Study of single - phase full wave McMurray Bedford inverter.
11. Single phase dual converter with R & RL loads. (Circulating and non circulating modes)
12. Three phase fully/half controlled rectifier with R, RL and RLE loads.
13. Speed control of Universal motor.

14. Characteristics of PWM converter.
15. Characteristics of Morgan's chopper.
16. Characteristics of PWM inverter.
17. Converter based DC motor control .
18. Inverter based Induction motor control .

NOTE: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for end semister Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. *Power Electronics, circuits, devices and applications by M.H. Rashid Pearson 3rd edition, 2005.*
2. *Power Electronics by M.D.Singh and Khanchandani TMH, 2nd Edition*
3. *Power Electronics by P.S. Bhimbra Khanna publications, 3rd Edition 2006.*

IV/IV Year B.Tech.-Seventh Semester

EE- 452 POWER SYSTEMS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*:*	*40*
		Semester End Exam Marks	*:*	*60*
Semester End Exam	*: 3 hrs*	*Credits*	*:*	*2*

Course Objectives:

- *To expose the students to the equipment in electrical engineering practice.*
- *To make the students to analyze different types of faults in power systems.*
- *To create concepts towards study of existing power network for design of compensation devices.*
- *To study the performance of insulators and cables by High voltage testing*

Learning outcomes:

The students accomplish

- *An ability to select and design protective devices for various equipment used in Electrical Industry.*
- *An ability to determine impedances of various rotating machines.*
- *An ability to design capacitors to improve power factor practically.*
- *An ability to determine parameters of transmission line, loading capability, compensation equipment required in practical transmission network.*
- *An ability to Analyze the performance of insulators and cables by High voltage testing.*

LIST OF EXPERIMENTS:

1. Characteristics of over current relay & Earth fault relay.
2. Characteristics of over voltage / under voltage relay.
3. Characteristics of differential relay.
4. Characteristics of definite time reverse power relay.
5. Characteristics of negative sequence relay.
6. Sequence impedances of alternator.

7. Harmonic analysis using power network analyzer.
8. Characteristics of distance relays.
9. Power factor correction of induction motor.
10. Determination of Transmission line parameters.
11. Regulation and efficiency of transmission line including Ferranti effect
12. Reactive power control by tap changing transformers.
13. Sequence impedances of transformer.
14. Grading of Insulators.
15. Short circuit studies using DC network analyzer.
16. Compensation of transmission line model using Facts devices.
17. H.V. testing of Insulators.
18. High voltage testing of cables .

NOTE: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for end semister Examination.

LEARNING RESOURCES:

REFERENCE BOOKS:

1. *Modern power system analysis by Nagrath&Kothari , TMH 3rd edition.*
2. *Electrical power systems by C.L. Wadhwa, New age International (P) Limited.*
3. *Power system analysis by TK Nagsarkar and Sukhija, Oxford press.*

IV/IV Year B.Tech.-Seventh Semester

EE -453 TERM PAPER

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 100*
		Semester End Exam Marks	*: _*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To keep ready the students with oral communication skills to become an affective communicator for both technical and non-technical stakeholders.*
- *To prepare students to express the knowledge they have gained in the areas related to electrical and electronics engineering.*
- *To identify their research area/topic and complete the groundwork and preliminary research required for it comfortably.*
- *To train the students to make use of research tools and material available both in print and digital formats.*

Learning outcomes:

- *The student along with his group identifies the topic for project work in prior in term paper.*
- *The Student will be able to understand the problem and its analysis.*
- *The student will be able to know the latest tools available to get the solution.*

Guide Lines:

At the end of the Semester, the batch must submit a report, on the work they have pursued throughout the Semester containing.

- *The aim and objective of the study.*
- *The Rationale behind the study.*
- *The work already done in the field identified.*
- *Hypothesis, experimentation and discussion.*
- *Conclusion and further work possible.*
- *Appendices consisting of Illustrations, Tables, Graphs etc.,*

Evaluation will be done for the presentation made and the report submitted

IV/IV Year B.Tech.-Eighth Semester

EE - 421 PROFESSIONAL ETHICS AND HUMAN VALUES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

This course amply covers the updated syllabus of Professional Ethics and Human Values. Besides the basic human values, Codes of ethics of major Indian professional societies, detailed risk analysis with illustrative examples are included. To create awareness, conviction & commitment to values for improving the quality of life through education, and for advancing social and human well being.

- *To introduce to the Ethical concepts that are relevant to resolving Moral issues in Engineering and to impart reasoning and analytical skills needed to apply ethical concepts to Engineering decisions.*
- *Recognize the need for life long learning and have the knowledge and skills that prepare them to identify the Moral issues involved in both Management and Engineering areas and to provide an understanding of the interface between Social, Technological and Natural environments.*
- *Enter into engineering work environment with well developed reasoning and analytical skills.*
- *To help the students appreciate the essential complementarily between "VALUES" and "SKILLS" to ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
- *To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.*
- *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with nature.*

Learning outcomes:

On completion of this course students would be able to apply their knowledge and understanding of Professional Ethics to:

- The students were able to understand the moral requirements of engineering experiments and have a clear understanding about, Lack of communication, prejudice in not asking for clarification, fear of law and plain neglect will lead to the occurrence of many repetitions of past mistakes.
- The students were able to clearly point out that the Engineer should not fully depend on hand books and they should also have some review of the past cases relating to their current tasks.
- They were able to comprehend a specific set of behaviors and values the professional interpreter must know and must abide by, including confidentiality, accuracy and integrity.
- They were able to realize the significance of the need of laws and regulations in directing Engineering practices.
- Protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest.
- Know and respect existing laws pertaining to professional work.
- Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.
- Have the ability to apply their knowledge to the solution of practical and useful problems;
- To impart reasoning and analytical skills needed to apply ethical concepts to Engineering decisions.

COURSE CONTENT :

UNIT - I [Text Books- 1&2]

Human Values: Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - honesty -Courage - Valuing Time - Co-operation - Commitment - Empathy - Self - Confidence - Character - Spirituality.

(16)

UNIT - II [Text Books- 1 &2]

Engineering Ethics: Senses of 'Engineering Ethics' - Variety of model issues - Types of inquiry - Moral dilemmas - Moral Autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Professions and Professionalism - Professional Ideals and Virtues - Theories about right action - Self-interest - customs and Religion - Uses of Ethical Theories. (13)

UNIT - III [Text Books- 1 &2]

Engineering as Social Experimentation: Engineering as Experimentation - Engineers as responsible Experimenters - Codes of Ethics - A Balanced Outlook on Law.

Safety, Responsibility and Rights: Safety and Risk-Assessment of Safety and Risk - risk Benefit analysis and reducing risk.

Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - employee Rights - Intellectual Property Rights (IIPR) - Discrimination. (21)

UNIT - IV [Text Books- 1 &2]

Global Issues: Multinational Corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers - consulting Engineering - Engineers as Expert Witnesses and Advisors - Moral Leadership - Sample Code of Ethics like ASME, ASCE, IEEE, Institution of engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc. (14)

LEARNING RESOURCES

TEXT BOOKS:

1. *Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York 1996.*
2. *Govindarajan. M, Natarajan. S, Senthilkumar. V.S, "Engineering Ethics", Prentice Hall of Inida, 2004.*

REFERENCE BOOKS:

1. *Charles D Fleddermann, "engineering Ethics", Prentice Hall, New Jersey, 2004 (Indian Reprint).*
2. *Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, United States, 2000 (Indian Reprint now available).*
3. *John R Boatright, "Ethics and the Conduct of Business", Pearson Educaiton,New Delhi, 2003.*
4. *Edmund G Seebauer and Robert L Barry, "fundamentals of ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.*

WEB RESOURCES:

1. *http://www.professionalethics.ca/*
2. *http://ethics.tamu.edu/*
3. *http://en.wikipedia.org/wiki/Professional_ethics*

IV/IV Year B.Tech.-Eighth Semester

EE - 422 UTILIZATION OF ELECTRICAL POWER

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To make students learn the various usage of electrical energy such as illumination, heating, welding etc.*
- *To impart the knowledge on electric traction as it is one of the most important applications of Electrical Engineering.*
- *To provide specific knowledge of Principles and characteristics of Lead-acid and Ni-Cad batteries, importance of float charge, initial charge and equalizing charge and affect over discharge of batteries.*
- *To derive the heating and cooling curve and to study the various classes of duty and Selection of power rating.*

Learning outcomes:

After completing this course, students will be able to:

- *Select the motor power rating for the specific application.*
- *Know how to utilize the electrical energy for production of heat and welding process.*
- *Designing of heat elements such as furnaces and ovens.*
- *Know the lighting calculations for different kinds of applications.*

COURSE CONTENT:

UNIT - I [Text Books- 1& 2]

Motor Power Rating and selection: General considerations in selecting motor power ratings - Selection of motor capacity for continuous duty - Equivalent current, torque and power methods - Selection of capacity for short time and intermittent periodic duty - Heating and cooling of motors - Load equalization - fly wheel and its applications in load equalization.

Storage batteries: Applications - rating - classification-dry cell and wet cells-primary and secondary cells-charging and discharging of lead acid cells, trickle charging-methods of charging lead acid batteries-over

discharging-common troubles with lead acid batteries and remedies-Nickel cadmium batteries. (20)

UNIT - II [Text Book- 1]

Electric Traction: Systems of electric traction - transmission of drive - mechanics of train movement, speed-time curves-effect of speed, acceleration and distance on schedule - Power and energy output from driving axles - specific energy output - series-parallel method of speed control - shunt bridge transition - collectors (15)

UNIT - III [Text Book- 1]

Electric Heating: Elementary principles of heat transfer - Stefan's law - electric furnaces - resistance furnace - design of heating element - losses and efficiency - Construction and working of different types of induction furnaces - Dielectric heating - arc furnaces - control equipment.

Welding: Types of welding - resistance and arc welding - Characteristics of Carbon and metallic arc welding - comparison. (Excluding electronic controls) (16)

UNIT - IV [Text Book- 1]

Illumination: Light production by excitation - Gas discharge lamps - Fluorescent lamps - Ultra violet lamps - Arc lamps - Filament lamps - Polar curves - Effect of voltage variation - Lighting calculations solid angle and square law methods of calculation - Factory lighting - flood lighting and street lighting-Introduction to Compact Fluorescent Lamps - Introduction to LED lighting systems. (12)

LEARNING RESOURCES:

TEXT BOOKS:

1. Utilization of Electrical Power and Electric Traction by J.B.Gupta, S.K.Kataria&sons publications, 9th edition
2. Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna publishers, first edition 2005.

REFERENCE BOOKS:

1. Generation distribution and utilization of electrical energy by CL Wadhwa, New Age 2005.

2. 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., 2001.
3. Utilization Electric Power by Openshaw Taylor Orient Longman, 1986.
4. Art and Science of Utilization of Electrical Energy by Partab H, Dhanpat Rai and Sons, New Delhi. Second edition.

WEB REFERENCES:

1. http://nptel.iitm.ac.in/video.php?subjectId=108105060
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Illumination%20Engg/New_index1.html
3. www.bee-india.org
4. www.eia.doe.gov
5. www.irfca.org

IV/IV Year B.Tech.-Eighth Semester

EE - 423 COMPUTER APPLICATIONS TO POWER SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To form incidence matrices and to prepare primitive impedance and admittance matrices with and without mutual coupling.*
- *To develop network performance equations and formation of network matrices using singular and non singular transformations.*
- *To teach the methods of mathematical formulation of complex power system and programming methods for short circuit, power flows and transient stability analysis.*
- *To deal with the numerical methods studied in applied mathematics courses to get the solutions of load flow, transient stability- comparison of different methods.*
- *To prepare the student for developing algorithms with the software packages available in order to get the solution of power system problems.*

Learning outcomes:

- *Acquire the knowledge of analyzing power system for power flow, short circuits, stability studies etc.*
- *Develop algorithms and write programs for implementation by appropriate modeling.*
- *Develop algorithms and to simulate power systems during project work.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications.*
- *Invent new algorithms for real time power system problems.*

COURSE CONTENT :

UNIT - I [Text Books 1&2]

Incidence & Network Matrices: Element-node incidence matrix - reduced incidence matrix or bus incidence matrix - basic loop incidence

matrix - augmented loop incidence matrix - basic cut set incidence matrix - augmented cut set incidence matrix - branch path incidence matrix - concept of primitive network - primitive impedance and admittance matrices with and without mutual coupling - network performance equations - formation of network matrices using singular &non singular transformation. (19)

UNIT - II [Text Books 1,2&4]

Algorithm for formation of network matrices & short circuit studies: Formation of bus admittance and bus impedance matrices and respective algorithms - modifications of bus impedance and admittance matrices for changes in the networks with and without mutual coupling - representation of three phase network elements for balanced and unbalanced systems - short circuit calculations for symmetrical and unsymmetrical faults using bus impedance matrix. Data preparation for short circuit program. (14)

UNIT - III [Text Book 1&Reference Book 3]

Formulation of Load Flow Problem: Introduction - non linear equations - solution techniques using Gauss iterative, Gauss Seidal and Newton Raphson (rectangular and polar) methods using bus admittance matrix - acceleration of convergence - development of flow charts for load flow problems - comparison of different load flow methods. Data preparation for load flow program. (16)

UNIT - IV [Text Book 1&Reference Book 3]

Formulation of Transient Stability Problem: Representing synchronous machine by constant voltage behind transient reactance (d- axis) and network by steady state equations - alternating solution approach for transient stability solving algebraic equations and differential equations alternately - numerical stability aspects of different integration schemes - combined solution approach. Flow chart for digital simulation of transient stability problem.

Development of state equation (linearised version) for steady state stability of power systems with single machine connected to infinite bus using swing equation for the machine and incorporating excitation (IEEE, 1981) turbine and speed governor controls. (13)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Computer methods in Power System Analysis by Stagg, G.W. & El-Abiad TMH.*
2. *Computer Techniques in Power System Analysis by M.A. Pai,TMH 2005.*
3. *Power System Stability & Control by P. Kundur , TMH 1998.*
4. *Advanced Power System Analysis and Dynamics by L.P. Singh Wiley Eastern Ltd., New Delhi 3rd edition 1993.*

REFERENCE BOOKS:

1. *Electric Energy systems Theory - by O.I.Elgerd, Tata McGraw-hill Publishing Comapany Ltd., Second edition 1983.*
2. *Control and stability of Power Systems by Anderson &Fouad, Iowa state university press.*
3. *Modern power system analysis by Nagrath&Kothari TMH 3rd edition.*

WEB REFERENCES:

1. *ieeexplore.ieee.org/iel5/39/22132/01029972.pdf?arnumber. % reference for applications*
2. *pec.ac.in/deptt/Elect/7th%20Sem.Elect.pdf % Introductory online tutorials*
3. *umpir.ump.edu.my/72/1/cd2621.pdf % Reference for Matlab control system tool*
4. *courses.engr.illinois.edu/ece476/notes/html % Reference for power flow analysis*

IV/IV Year B.Tech.-Eighth Semester

EE - 424/A FACTS CONTROLLERS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 4*

Course Objective:

- *To understand the need for FACTS.*
- *To learn shunt and series compensation techniques.*
- *To learn about controlled voltage and Phase angle regulator.*
- *To learn the concept of unified power flow controller and IPFC.*

Learning outcomes:

The students will be able to demonstrate knowledge and understanding of:

- *Need of FACTS controllers in Power System network .*
- *Fundamental concepts of FACTS controllers.*
- *Classification of FACTS controllers.*
- *Factors that influence power system operation and control.*
- *Methods to improve and maintain stability.*
- *Static Shunt and Series compensating methodologies.*
- *The concept of functional control schemes of FACTS devices.*
- *Basic structure of different FACTS controllers.*

COURSE CONTENT :

UNIT-I [Text Book- 1]

FACTS Concept and General system Considerations: Power Flow in AC system - definitions on FACTS - Basic types of FACTS Controllers. Converters for Static Compensation - Three Phase Converters and Standard Modulation Strategies (Programmed Harmonic Elimination and SPWM) - GTO Inverters - Multi-Pulse Converters and Interface Magnetics - Transformer Connections for 6 and 12 pulse operation. (14)

UNIT-II [Text Book- 1]

Static Shunt Compensators: SVC and STATCOM - Operation and Control of TSC, TCR, STATCOM - Comparison between SVC and

STATCOM - STATCOM for transient and dynamic stability enhancement. (11)

UNIT-III [Text Book-1]

Static Series Compensation: GCSC, TSSC, TCSC and SSSC - Operation and Control - External System Control for series Compensators - SSR and its damping - Static Voltage and Phase Angle Regulators - TCVR and TCPAR - Operation and Control. (19)

UNIT-IV [Text Book-1]

UPFC and IPFC: The unified Power Flow Controller - Operation - Comparison with other FACTS devices - control of P and Q - Dynamic Performance - Special Purpose FACTS controllers - Interline Power flow Controller - Operation and Control. (10)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, 2000 by N.G. Hingorani&L.Gyugyi.*
2. *Reactive Power Control in Electric Systems by T.J.E. Miller , John Wiley & sons.*

REFERENCE BOOKS:

1. *FACTS controllers in power transmission and distribution by Padiyar KR, New Age.*
2. *Power Electronics, circuits, devices and applications by M.H. Rashid Pearson 3rd edition, 2005.*
3. *Journal & Conference papers from IEEE.*

WEB REFERENCES:

1. *http://www.eetindia.co.in/VIDEO_DETAILS_700001240.HTM*
2. *http://nptel.iitm.ac.in*
3. *www.ece.unb.ca/sharaf/downloads/ppt/ppt_046.ppt*

IV/IV Year B.Tech.-Eighth Semester

EE-424/B EHV AC TRANSMISSION

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 4*

Course Objectives:

- *To know the power handling capacities and line losses of a transmission line.*
- *To calculate geometric mean radius and inductance of two conductor lines and multi conductor lines.*
- *To study the Effect of high electrostatic field on biological organisms and human beings.*
- *To understand the Corona in EHV lines and various corona loss formulae.*
- *To gain knowledge on static reactive compensating systems.*

Learning outcomes:

- *Understand the power handling capacities and line losses of a transmission line.*
- *Gain knowledge on the geometric mean radius and inductance of two conductor lines and multi conductor lines.*
- *Get the knowledge on effect of high electrostatic field on biological organisms and human beings.*
- *Concept of Corona in EHV lines and mathematical ability on various corona loss formulae.*
- *Understand various static reactive compensating systems.*

COURSE CONTENT :

UNIT- I [Text Book- 1]

E.H.V. A.C. Transmission: line trends and preliminary aspects ,standard transmission voltages - power handling capacities and line losses - mechanical aspects.

Calculation of Line Resistance and Inductance : resistance of conductors, temperature rise of conductor and current carrying capacity. Properties of bundled conductors and geometric mean radius of bundle, inductance of two conductor lines and multi conductor lines, Maxwell's coefficient matrix. (13)

UNIT- II [Text Book- 1]

Line Capacitance Calculation : capacitance of two conductor line, and capacitance of multi conductor lines, potential coefficients for bundled conductor lines, sequence inductances and capacitances and diagonalization. Calculation of electro static field of AC lines - Effect of high electrostatic field on biological organisms and human beings. (10)

UNIT - III [Text Book- 1]

Surface voltage Gradient on conductors, surface gradient on two conductor bundle and cosine law, maximum surface voltage gradient of bundle with more than 3 sub conductors, Mangolt formula.

Corona : Corona in EHV lines - corona loss formulae - attenuation of traveling waves due to corona - Audio noise due to corona, its generation, characteristics and limits, measurement of audio noise. (14)

UNIT -I [Text Book- 1]

Power Frequency Voltage Control : Problems at power frequency, generalized constants, No load voltage conditions and charging currents, voltage control using synchronous condenser, cascade connection of components : Shunt and series compensation, sub synchronous resonance in series - capacitor compensated lines.

Static reactive compensating systems : Introduction, SVC schemes, Harmonics injected into network by TCR, design of filters for suppressing harmonics injected into the system. (15)

LEARNING RESOURCES:

TEXT BOOKS :

1. *Extra High Voltage AC Transmission Engineering - Rakosh Das Begamudre, Wiley Eastem ltd., New Delhi - 1987.*
2. *EHV Transmission line reference book - Edision Electric Institute (GEC) 1986.*

REFERENCE BOOK:

1. *EHV AC/ DC Transmission engineering and practice by S.Rao, Khanna publications.*

WEB REFERENCES:

1. *www.aep.com/.../AEP_Open_Access_Transmission_Tari...*
2. *http://books.google.co.in/books/about/Extra_High_Voltage_ A_C_ Transmission_Engi.html*
3. *http://www.newagepublishers.co*

IV/IV Year B.Tech.-Eighth Semester

EE - 424/C DIGITAL CONTROL SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The main objectives of this course are

- *To provide sufficient theoretical and analytical background to understand the concepts of continuous time discrete systems.*
- *To understand the basics of Z- Transform.*
- *To study the stability analysis of digital control system.*
- *To equip the basic knowledge of state feedback controller design.*
- *To understand the modelling and analysis of digital control systems using state space representation.*

Learning outcomes:

The student will be able to

- *Understand the concepts of continuous time discrete systems.*
- *Assess the stability of digital control system.*
- *Get the knowledge about the Z- Transforms.*
- *Get the knowledge of state feedback controller design.*
- *Connect the course content to real time applications in various electrical and electronics engineering applications.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Sampling and Z-plane Analysis : Introduction, sample and hold operations, Sampling theorem, Reconstruction of original sampled signal to continuous-time signal.

Review of 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: Primary strips and Complementary Strips. (14)

UNIT - II [Text Book- 1],[Text Book- 3]

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.

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function. (18)

UNIT - III [Text Book- 1],[Text Book- 3]

Stability Analysis: Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test - Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.Stability analysis using Liapunov theorems.

Design Of Discrete Time Control System By Conventional Methods: Design of digital control 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. Design digital control through deadbeat response method. (17)

UNIT - IV [Ref. Book- 2]

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.

Linear Quadratic Regulators: Min/Max principle, Linear Quadratic Regulators (11)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.*
2. *Digital Control and State Variable Methods by M.Gopal, TMH.*
3. *Discrete-Time Control systems - K. Ogata, Pearson Education.*

REFERENCE BOOKS:

1. *Digital Control Engineering, M. Gopal Wiley Eastern.*
2. *ModerncontrolengineeringbyK.Ogata,PHI.*

WEB REFERENCES:

1. *www.dcs-inc.net*
2. www.dcsmicros.com
3. www.idsc.ethz.ch/Courses/digital_control
4. www.dynacord.com
5. www.dicsglobal.com

IV/IV Year B.Tech.-Eighth Semester

EE - 424/D EMBEDDED SYSTEMS & VLSI

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: _ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To understand the concept of an embedded system, to get the clarity of various design metrics for a system, To understand the concept of improving productivity by presenting a unified view of software & hardware, For the previous unified view here we should study 3 different key technologies.*
- *To Understand NMOS & CMOS and BICMOS process technology.*
- *To Understand about Technology Scaling.*
- *To understand various abstraction levels (syntheses) to be involved in the designing of an embedded system.*

Learning outcomes:

- *Able to gain the knowledge regarding an embedded system with different metrics, many types of key technologies.*
- *Able to gain knowledge of different VLSI fabrication processes and CMOS Logic Design.*
- *Able to know the effects of Scaling.*
- *Able to get the knowledge of different synthesis concepts.*

COURSE CONTENT :

UNIT-I [Text Book 1]

Introduction: Embedded systems overview - design challenge - processor technology - IC technology - Design technology - Trade offs.

Single purpose Processors: RT Level combinational logic - sequential logic (RT-LEVEL) - optimizing custom single purpose processors. General

Purpose processors: Basic architecture - operation - pipelining - programmer's view - development environment - application specific instrumentation - set processors (ASITPS) - Micro controllers and Digital signal processors. (15)

UNIT-II [Text Book 2]

MOS & BIMOS Technology: An introduction to MOS technology - BIMOS

technology - Basic electrical properties of MOS & BIMOS circuits - MOS and BIMOS circuit design processors - Basic circuit concepts - sheet resistance - area capacitances of layers - the delay unit - scaling of MOS circuits - scaling models - scaling factors for device parameters. (14)

UNIT-III [Text Book 2]

Subsystem design and layout: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic):Parity Generator, Bus Arbitration Logic.

Illustration of Design Process: Design of an ALU subsystem, Manchester carry chain, carry select adder, carry skip adder. (16)

UNIT-IV [Text Book 1]

Design Technology: Introduction to automation - synthesis - the parallel evolution of compilation and synthesis - logic synthesis - RT synthesis - behavioral synthesis - system synthesis and Hardware/Software code design - verification - Hardware/Software co simulation - reuse of intellectual property coder. (15)

LEARNING RESOURCES :

TEXT BOOKS:

1. Embedded system Design - A unified Hardware/ Software introduction by Frank Vahid, Tony D.Givargis.
2. ouglas A.Pucknell and Kamran Eshranghian, Basic VLSI Design, Third edition, PHI, 2002.

REFERENCE BOOKS:

1. Embedded Micro computer systems by Jonathan W. Valvano, Brooks/ cole, Thompson learning.
2. Modern VLSI Design by Wayne Wolf, Pearson Education.
3. Introduction to Embedded systems by Raj kamal, TMH, 2002.

WEB REFERENCES :

1. nptel.iitm.ac.in
2. http://www1bpt.bridgeport.edu/~matanya/vlsi/ictutor.html
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontroller

IV/IV Year B.Tech.-Eighth Semester

EE-424/E NON CONVENTIONAL ENERGY RESOURCES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To know the depletion rate of conventional energy resources and importance of renewable energy resources.*
- *To know alternate viable energy sources to meet the energy requirements.*
- *To discuss about solar energy, wind energy, tidal energy and geothermal energy as alternate resources.*

Learning Outcomes:

The student will be able to

- *Know the National scene of energy production, utilization, consumption and reserves.*
- *Appreciate the need for non-conventional energy sources.*
- *Understand relative advantages and disadvantage of various non-conventional energy sources.*
- *Understand basic heat transfer principle, storage methods available, working and construction related to solar collectors.*
- *Understand the assessment of wind energy potential, wind turbines and wind generators.*
- *Know about ocean energy, geo thermal energy and bio energy.*

COURSE CONTENT :

UNIT - I [Text Book- 1]

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management. (9)

UNIT - II [Ref. Book- 2]

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion - solar thermal central receiver systems - photovoltaic energy conversion - solar cells - 4 models. (11)

UNIT - III [Text Book- 1, Ref. Book- 2]

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator. (13)

UNIT - IV [Ref. Book- 1]

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction - tides - simple single pool tidal system.

Geothermal energy:Origin and types - Bio fuels - classification - direct combustion for heat and electricity generator - anaerobic digestion for biogas - biogas digester - power generation. (16)

LEARNING RESOURCES:

TEXT BOOKS:

1. *Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon*

REFERENCE BOOKS:

1. *Power Plant Technology by EL-Wakil, McGraw-Hill*
2. *Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.*

WEB REFERENCES:

1. *http://www.tn.gov.in/spc/tenthplan/CH_11_2.PD*
2. *http://bieap.gov.in/Nonconventionalenergysourses*
3. *http://www.em-ea.org/Guide%20Books/book-4/4.12App%20of% 20Non % 20conventional*

IV/IV Year B.Tech.-Eighth Semester

EE-424/F ENERGY CONSERVATION & AUDIT

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits :*	*4*

Course Objectives:

- *To provide acquaintance with analytical principles such as Energy audit, Co-generation.*
- *To provide information on Industrial Engineering techniques of Energy saving.*
- *To provide familiarity with plant level energy audit calculations.*

Learning outcomes:

After completing the course the students will be able to:

- *Suggest methods of energy conservation for different load conditions.*
- *Apply Tools for energy audit and recommend measures for energy conservation.*
- *Select appropriate tariff system and methods for reducing electricity consumption and energy saving.*

COURSE CONTENT :

Unit-I [Text Books 1&2]

System approach and End use approach to efficient use of Electricity - Electricity tariff types - Energy auditing: Types and objectives - audit instruments - ECO assessment and Economic methods- - specific energy analysis-Minimum energy paths-consumption models- Energy auditing of a typical industrial unit-case study. (12)

Unit- II [Text Books 1&3]

Electric motors- Energy efficient controls and starting efficiency-Motor Efficiency and load Analysis-Energy efficient / high efficient Motors-Case study; Load Matching and selection of motors. Variable speed drives; Pumps and Fans- Efficient Control strategies-optimal selection and sizing - Optimal operation and storage; Case study (14)

Unit-III [Text Books 2]

Transformer Loading/Efficiency analysis - feeder/cable loss evaluation, case study.

Reactive power management-Capacitor Sizing-Degree of Compensation-Capacitor losses - Location-placement-Maintenance, case study; Peak Demand controls-Methodologies - Types of Industrial loads - Optimal Load scheduling-case study;

Lighting - Energy efficient light sources - Energy conservation in Lighting Schemes -

Electronic ballast-Power quality issues-Luminaries, case study; (22)

Unit-IV [Text Books 1&2]

Cogeneration-Types and Schemes-Optimal operation of cogeneration plants-casestudy;

Electric loads of Air conditioning & Refrigeration-Energy conservation measures -

Cold storage - Types - Optimal operation - case study; Electric water heating -

Gysers-Solar Water Heaters - Power Consumption in Compressors - Energy

conservation measures - Electrolytic Process; Computer Controls-softwares-EMS. [16]

LEARNING RESOURCES:

TEXT BOOKS:

1. *Industrial Energy Management: Principles and Applications by Giovanni andPetrecca, The Kluwer international series-207 (1999).*
2. *Guide to Electric Load Management by Anthony J.Pansini, Kenneth D.Smalling,Pennwell pub (1988).*
3. *Energy-Efficient Electric Motors and their applications by Howard E.Jordan, Plenum pub corp; 2nd ed. (1994).*

REFERENCE BOOKS:

1. *Energy Management Hand book by Turner, Wayne C, Lilburn, The Fairmont press, 2001.*
2. *Handbook of Energy Audits by Albert Thumann, Fairmont Pr; 5th edition (1998).*
3. *Recommended practice for Energy Conservation and cost effective planning inIndustrial facilities by IEEE Bronze book, IEEE Inc, USA.*
4. *Plant Engineers and Managers Guide to Energy Conservation- 7th Ed. By AlbertThumann, P.W, TWI press Inc. Terre Haute.*
5. *Energy Efficiency manual by Donald R.W, Energy Institute press.*

6. *Art and Science of Utilization of Electrical Energy by Partab H, Dhanpat Rai &sons ,New Delhi.*
7. *Electric Energy Utilization and Conservation by Tripathy S.C, TMH.*
8. *Guide Book on promotion of sustainable energy consumption by NEDCAP.*

WEB RESOURCES:

1. *http://www.kmwsa.gov.in/o-m_manual/Chapter-16.pdf % O&M manual of water works and energy saving opportunities*
2. *http://www.energylens.com/articles/identify-energy-waste % Energy saving opportunities in various industrial applications*
3. *http://www.ecbcs.org/docs/annex_11_source_book_vol1.pdf% International energy agency source book for energy auditors vol1*
4. *http://www.ecbcs.org/docs/annex_11_source_book_vol2.pdf% International energy agency source book for energy auditors vol2*
5. *http://www.beeindia.in % Bureau of energy efficiency India - for information on energy efficiency*

IV/IV Year B.Tech.-Eighth Semester

EE - 461 SIMULATION OF ELECTRICAL SYSTEMS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To introduce to students of electrical & electronics engineering branch the simulation of various power electronic circuits, control system circuits and analysis of steady state system for short circuits and stability using different packages available.*
- *To simulate converter, chopper, AC voltage controller & inverter circuits using PSPICE.*
- *To familiarize the student with control system tool box in MATLAB.*
- *To simulate power system networks for load flow, short circuit analysis, relay coordination and transient stability using Mi-Power software.*

Learning Outcomes:

- *An ability to simulate different power electronic circuits using PSPICE.*
- *An ability to simulate different control systems problems using MATLAB.*
- *An understanding of analysis of RLC circuits using EMTP.*
- *Skill to determine steady state stability analysis, short circuit studies and relay co-ordination of power systems using MIPOWER.*

List of Experiments:

1. Simulation of a single-phase full-bridge converter with different loads
2. Simulation of static characteristics of SCR.
3. Simulation of a resonant pulse commutation circuit and buck chopper.
4. Simulation of an AC voltage controller with various loads.
5. Simulation of single-phase inverter with PWM control.
6. Modeling of transformer.
7. Transfer function analysis of a given circuit .
8. State model representation of transfer functions .
9. Plotting of Bode, Nyquist and root-locus plots for transfer functions.

10. Steady state and Transient analysis of RLC circuits.
11. Short circuit studies in power systems.
12. Transient stability analysis of power systems.
13. Relay co-ordination in power systems.
14. Simulation of two area system.
15. Develop a program for Ybus by inspection.
16. Develop a program for Zbus usingZbus building algorithm.
17. Develop a program for Load flow analysis by Gauss - Seidel method
18. Develop a program for load flow analysis by Newton - Raphson method
19. Develop program for load flow analysis by FDLP method.

NOTE: Minimum of ten experiments have to be performed and recorded by the candidate to attain eligibility for end semister Examination.

Simulation is to be carried out with the following software PSPICE/ MATLAB/ MiPower/ PSIM/ PSCAD/ EMTP.

LEARNING RESOURCES:

TEXT BOOKS:

1. *Computer methods in Power System Analysis by Stagg, G.W. & El-Abiad TMH.*
2. *Computer Techniques in Power System Analysis by M.A. Pai , TMH 2005*
3. *Power Electronics, circuits, devices and applications by M.H. Rashid Pearson 3rd edition, 2005.*
4. *Control systems by A. Ananda Kumar, PHI.*

WEB REFERENCES:

1. *www.wikipedia.com*
2. *http://nptel.iitm.ac.in*

IV/IV Year B.Tech.-Eighth Semester

EE - 462 PROJECT WORK

Practicals	*: 9 periods / week*	*Sessional Marks*	*: 80*
		Semester End Exam Marks	*: 120*
Semester End Exam:	*3 hrs*	*Credits*	*: 10*

Course Objectives:

Project work is aimed at

- *Implementation of the problem identified in Term Paper EE453.*
- *Application of theory learned so far in Electrical and Electronics Engineering.*
- *Make use of research tools and material.*
- *Consolidation of Hardware/Software skills for a real world /research problem.*
- *Improvement of problem solving skills.*
- *Improvement of report writing, word processing skills and documentation skills.*

Learning outcomes:

The student will have an exposure to

- *Research and development procedures.*
- *Latest developments in the selected areas, software development.*
- *Development of a prototype solution to industrial/ theoretical problems and publish paper in National or International conferences.*
- *Function effectively on teams to accomplish a common goal.*

Guide Lines:

The sessional marks shall be awarded based on the weekly progress, the performance in two Seminars and the Project Report submitted at the end of the semester. The allotment of sessional marks for Seminars and day-to-day class work shall be 30 and 50

Think Green
&
Go Green

Sree Lakshmi Press, Guntur-2 Ph:2230643