B.S.ABDUR RAHMAN
U N I V E R S I T Y
B.S.ABDUR RAHMAN INSTITUTE OF SCIENCE & TECHNOLOGY
(Estd.u/s 3 of the UGC Act, 1956)
(FORMERLY B.S.ABDUR RAHMAN CRESCENT ENGINEERING COLLEGE)
Seethakathi Estate, G.S.T. Road, Vandalur, Chennai - 600 048.

REGULATIONS (2009), CURRICULUM AND SYLLABUS
FOR
B.Tech. (ELECTRICAL AND ELECTRONICS ENGINEERING)
(EIGHT SEMESTERS / FULL TIME)

(Updated upto June 2011)

REGULATIONS - 2009 FOR B.TECH. DEGREE PROGRAMMES
(with modefications incorporated in June - 2011)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means B.Tech. Degree Programme

ii) **"Branch"** means specialization or discipline of B.Tech Degree Programme like Civil Engineering, Polymer Technology, etc.,

iii) **"Course"** means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, Engineering Graphics, Computer Practice, etc.,

iv) **"University"** means B.S.Abdur Rahman University.

v) **"Dean (Academic Courses)"** means Dean (Academic Courses) of B.S. Abdur Rahman University.

vi) **"Dean (Students)"** means Dean(Students) of B.S.Abdur Rahman University

vii) **"Controller of Exams"** means the Controller of Examination of B.S. Abdur Rahman University, who is responsible for conduct of examinations and declaration of results.

2.0 ADMISSION

2.1 a) Candidates for admission to the first semester of the eight semester B.Tech. degree programme shall be required to have passed the Higher Secondary Examination of the (10+2) curriculum (Academic stream) prescribed by the appropriate authority or any other examination of any university or authority accepted by the University as equivalent thereto.

2.1 b) Candidates for admission to the third semester of the eight semester B.Tech. programme under lateral entry scheme shall be required to have passed the Diploma examination in Engineering / Technology of the Department of Technical Education, Government of Tamilnadu or any other examination of any other authority accepted by the University as equivalent there to.

2.2 Notwithstanding the qualifying examination the candidate might have passed, the candidate shall also write an entrance examination prescribed by the University for admission. The entrance examination shall test the proficiency of the candidate in Mathematics, Physics and Chemistry on the standards prescribed for plus two academic stream.

2.3 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the University from time to time.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. degree programmes in various branches of Engineering and Technology, each distributed over eight semesters with two semesters per academic year.

B.TECH. DEGREE PROGRAMMES:

Civil Engineering

Mechanical Engineering

Aeronautical Engineering

Automobile Engineering

Polymer Technology

Electrical and Electronics Engineering

Electronics and Communication Engineering

Electronics and Instrumentation Engineering

Computer Science and Engineering

Information Technology

4.0 STRUCTURE OF PROGRAMMES:

4.1 Every Programme will have a curriculum with syllabi consisting of theory and practical courses such as,

i) General core courses comprising mathematics, basic sciences, engineering sciences, humanities and engineering arts.

ii) Core courses of Engineering / Technology

iii) Elective courses for specialization in related fields.

iv) Workshop practice, laboratory work, industrial training, seminar presentation, project work, education tours, etc.,

v) NCC/NSS/NSO/YRC activities for character development.

4.2 Each course is normally assigned certain number of credits with one credit per lecture period per week, one credit per tutorial period per week, one credit for two - three periods of laboratory or practical or seminar or project work per week and one credit for four weeks of industrial training during semester vacations.

4.3 Each semester curriculum shall normally have a blend of lecture courses not exceeding six and practical courses not exceeding four.

4.4 For the award of the degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. This minimum will lie between 175 and 185 credits, depending on the branch.

4.5 The medium of instruction, examinations and project report will be English, except for courses on languages other than English.

5.0 DURATION OF THE PROGRAMME

A student is ordinarily expected to complete the B.Tech. programme in eight semesters (six semesters in the case of lateral entry student), but in any case not more than 14 semesters (12 semesters in the case of lateral entry student). Each semester shall normally consist of around 90 working days or 450 working hours. Semester end examination will normally follow immediately after the last working day of the semester.

6.0 FACULTY ADVISOR

To help the students in planning their courses of study and for general counseling on the academic programme, the Head of the Department of the student will attach a certain number of students to a teacher of the Department who shall function as Faculty Advisor for the students throughout their period of study. Such Faculty Advisor shall advise the students and approve the courses to be taken by the students during registration and enrolment every semester.

7.0 COMMON COURSE COMMITTEE

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the course **Co-coordinator** shall be made by the Head of the Department / Dean (Academics), depending on whether all the teachers teaching the common course belong to the same department / different departments.

8.0 CLASS COMMITTEE

During first semester, a common Class Committee will be constituted for all branches by the Dean (Academic Courses). During other semesters, separate Class Committees will be constituted by the respective Head of the Department of the students.

8.1 The first semester Class Committee composition will be as follows:

i) Course Co-coordinators of all common courses.

ii) Teachers of all other individual courses.

iii) One male and one female first semester student of each branch of B.Tech, to be nominated by the Head of the Institution.

iv) All first semester Faculty Advisors as optional Special Invitees.

8.2 The composition of the class committee for each branch of B.Tech , from 2nd to 8th semester, will be as follows:

i) One senior faculty member preferably not teaching to the concerned class, appointed as Chairman by the Head of the Department

ii) Teachers of individual courses

iii) Two students, (preferably one male and one female) of the class per group of 30 students or part thereof, to be nominated by the Head of the Department, in consultation with the faculty advisors.

iv) All faculty advisors of the class

v) Teacher-in-charge of UG programme

vi) Head of the Department

8.3 The class committee shall meet at least thrice during the semester. The first meeting will be held within two weeks from the date of class commencement, in which the type of assessments, like test, assignment, assignment based test etc., will be decided for the first, second and third assessments. The second meeting will be held within a week after the date of first assessment report, to review the students' performance and for follow up action. The third meeting will be held within a week after the second assessment report, to review the students' performance and for follow up action.

8.4 During these three meetings the student members representing the entire class, shall meaningfully interact and express opinions and suggestions of the class students to improve the effectiveness of the teaching-learning process.

8.5 The class committee, **excluding the student members and the invited members,** shall meet within 10 days from the last day of the end-semester examination to analyse the performance of the students in all the components of assessments and decide the grades secured by students in each course. The grades in a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

9.0 REGISTRATION AND ENROLMENT

9.1 Except for the first semester, every student shall register for the ensuing semester during a specified week before the end semester examination of the current semester. Every student shall submit a completed Registration form indicating the list of courses intended to be credited during the ensuing semester. Late registration with the approval of Dean (AC) along with a late fee will be permitted up to the last working day of the current semester.

9.2 From the second semester onwards, all students shall pay the prescribed fees for the semester on a specific day at the beginning of the semester confirming the registered courses. Late enrolment, with the approval of Head of the Institution along with a late fee, will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

9.3 The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

9.4 A student should have registered for all preceding semesters before registering for a particular semester.

10.1 CHANGE OF A COURSE

A student can change a course within a period of 15 days from the commencement of the course, with the approval of the Dean(AC), on the recommendation of the Head of the Department of the student.

10.2 WITHDRAWAL FROM A COURSE

A student can withdraw from a course at any time before the second assessment for genuine reasons, with the approval of the Dean(AC), on the recommendation of the Head of the Department of the student.

11.0 TEMPORARY BREAK OF STUDY FROM A PROGRAMME

A student can take a one time temporary break of study covering the current semester and/or next semester period with the approval of the Head of the Institution at any time before the start of third assessment of current semester, within the maximum period of 14 or 12 semesters as the case may be. If any students is debarred for want of attendance or suspended due to any act of indiscipline it will not be considered as break of study.

12.0 CREDIT LIMIT FOR ENROLMENT & MOVEMENT TO HIGHER SEMESTER

12.1 A student can enroll for a maximum of 30 credits during a semester period including redo courses.

12.2 The minimum credits required to move to 3rd semester B.Tech shall be 10 credits earned in the 1st semester. There will be no such minimum credit requirement to move to the remaining 4th to 8th semesters.

12.3 A student who has not satisfied the NCC/NSS/NSO/YRC requirements (vide clause 19) will not be eligible to register for the fifth semester courses, even though he / she may satisfy all other requirements.

13.0 SUMMER TERM COURSES

13.1 A student can register for a maximum of three courses during summer term, If such courses are offered by the concerned department during the summer term. Fast-track summer courses of 30 periods for 3 credit courses and 40 periods for 4 credit courses will be offered for students with I grades. They may also opt to redo such courses during regular semesters with slotted time-tables.

13.2 The Head of the Department, in consultation with the department consultative committee and with the approval of the Head of the Institution may arrange for the conduct of a few courses during the summer term, depending on the availability of teachers during summer and subject to a specified minimum number of students registering for each of such courses.

13.3 However, in the case of students who have completed eighth semester, but having arrears in the earlier semesters in a maximum of two courses, summer courses may be offered, even if less than minimum students are registering for the course.

13.4 The number of contact hours and the assessment procedure for any course during summer term will be the same as those during regular semesters except that there is no provision either for withdrawal from a summer term course or for substitute examination.

14.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

14.1 Every theory course shall have a total of four assessments during a semester as given below:

Assessment No.	Course coverage in weeks	Duration	Weightage of marks
Assessment 1	1 to 4	1.5 hours	50/3
Assessment 2	5 to 8	1.5 hours	50/3
Assessment 3	9 to 12	1.5 hours	50/3
Semester End Exam	1 to 18 (full course)	3 hours	50

14.2 The pattern of questions, for at least one of the tests, shall be the same as stipulated for the semester end examination by the University. Teachers handling courses are given the option to substitute with other suitable alternate type of evaluation approved by the class committee and the HOD. The details of such a scheme shall be announced to the students and informed to the Dean(AC) at the beginning of the semester.

14.3 Every practical course will have 75% weightage for laboratory assessment and 25% for semester end examination.

14.4 In the case of Industrial training, the student shall submit a report, which will be evaluated along with an oral examination by a committee of teachers, constituted by the Head of the department. A progress report from the industry will also be taken into account for evaluation.

14.5 In the case of project work, a committee of teachers constituted by the Head of the Department will carry out three periodic reviews. Based on the project report submitted by the student, an oral examination (viva-voce) will be conducted as the end-semester examination, for which one external examiner, approved by the Controller of Examinations, will be included. The weightage for periodic review will be 50% and remaining 50% for the semester end examination.

14.6 Assessment of seminars and comprehension will be carried out by a committee of teachers constituted by the Head of the Department.

15.0 SUBSTITUTE EXAMINATIONS

15.1 A student who has missed, for genuine reasons, a maximum of two of the four assessments of a course may be permitted to write a substitute examination. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accident or admission to a hospital due to illness, etc.

15.2 A student who misses any assessment in a course shall apply in a prescribed form to the Dean (AC) through the Head of the department within a week from the date of missed assessment. However the substitute tests and examination for a course will be conducted within two weeks after the last day of the end-semester examinations.

16.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

16.1 All assessments of a course will be made on absolute marks basis. However, the Class Committee without the student members and the invited members

shall meet within 10 days after the end-semester examinations and analyse the performance of students in all assessments of a course and award letter grade. The letter grades and the corresponding grade points are as follows:

Letter grade	Grade points
S	10
A	9
B	8
C	7
D	6
E	5
U	0
I	--
W	--

"W" denotes withdrawal from the course

"I" denotes inadequate attendance in the course and hence prevention from writing semester end examination.

"U" denotes unsuccessful performance in the course.

16.2 A student who earns a minimum of five grade points in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student

16.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department and declared by the Controller of Examinations.

16.4 Within two weeks from the commencement of classes for the next semester, a student can apply for revaluation of his / her semester end examination answer paper in a course, on payment of a prescribed fee, through proper application to Dean(AC), who shall constitute a revaluation committee consisting of Chairman of the Class Committee as convener, the teacher of the course and a senior member of faculty knowledgeable in that course. The committee shall meet within a week to revalue the answer paper and submit its report to the Controller of Examinations for consideration and decision

16.5 After results are declared, grade sheets shall be issued to each student, which will contain the following details. The list of courses enrolled during the semester including summer term courses, if any, and the grade scored, the Grade Point Average (GPA) for the semester and the Cumulative Grade

Point Average (CGPA) of all courses enrolled from first semester onwards. GPA is the ratio of the sum of the products of the number of credits of courses registered and the points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the semester, including summer courses, if any.

If C_i, is the number of credits assigned by for i^{th} course and GP_i is the Grade Point obtained in the i^{th} course

$$GPA = \frac{\sum_i (Ci)(GPi)}{\sum_i Ci}$$

The Cumulative Grade Point Average CGPA shall be calculated in a similar manner, considering all the courses enrolled from first semester.

"I" and "W" grades will be excluded for calculating GPA .

"U", "I" and "W" grades will be excluded for calculating CGPA

16.6 After successful completion of the programme, the Degree will be awarded with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all examinations in the first appearance and completing the programme within the normal 8 or 6(for lateral entry) semesters.
First Class	6.50 and above and completing the programme within a maximum of 10 or 8 (for lateral entry) semesters.
Second Class	All others

17.0 ATTENDANCE REQUIREMENT AND COURSE REPETITION

17.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% for genuine reasons like on medical grounds, representing the University in approved events etc., to become eligible to appear for the end-semester examination in that course, failing which the student shall be awarded "I" grade in that course. If the course is

a core course, the candidate should register for and repeat the course when it is offered next.

17.2 The teacher of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the Dean(AC) through the Head of the Department. There upon, the Dean (AC) shall announce, course-wise, the names of such students prevented from writing the semester end examination in each course.

17.3 A student should register to re-do a core course wherein "I" or "W" grade is awarded. If the student is awarded, "I", or "W" grade in an elective course either the same elective course may be repeated or a new elective course may be taken.

A student who is awarded **'U'** grade in a course will have the option of either to write semester end arrear exam at the end of the subsequent semesters, or to redo the course during summer term / regular semester.

If a student chooses to write the semester end arrear examination for the course, the grade will be calculated based on

either

continuous assessment marks already earned along with marks of the arrear examination

or

the arrear examination marks only,

whichever is higher.

The above procedure will be applicable for the First Year (First and Second Semester) and not for the remaining B.Tech Programmes.

From the Third Semester onwards the marks earned earlier in the continuous assessment for the course, will be used for grading along with the marks earned in the Semester end arrear examination for the course.

18.0 ELECTIVE CHOICE: OPTION TO DO PROJECT ALONE IN FINAL SEMESTER

18.1 Apart from the various elective courses listed in the curriculum for each branch of specialization, the student can choose a maximum of two electives from any other specialization under any department, during the entire period of study, with the approval of the Head of the parent department and the Head of the other department offering the course.

18.2 In the curriculum of eighth semester, along with the project work, if two elective courses alone are listed, then the Head of the Institution may permit a student, as per approved guidelines, on the recommendation of the Head of the department, to do a full semester major industrial project work. In such a case, the above two elective courses or any other two elective courses in lieu thereof have to be enrolled during any semester including the summer, preceding or succeeding the project work, if offered.

19.0 PERSONALITY AND CHARACTER DEVELOPMENT

19.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO/YRC and undergo practical training.

- **National Cadet Corps (NCC)** will have to undergo specified number of parades.
- **National Service Scheme (NSS)** will have social service activities in and around Chennai.
- **National Sports Organisation (NSO)** will have sports, games, drills and physical exercises.
- **Youth Red Cross (YRC)** will have social service activities in and around Chennai.

19.2 Every student shall put in a minimum of 75% attendance in the practical training specified by the concerned authority. Normally this is to be completed during the first year. For valid reasons, the Dean(AC) may permit a student to complete this requirement in the second year. **However, before enrolling for fifth semester, a student should have completed the training and produced a certificate from the appropriate authority of NCC / NSS / NSO / YRC for having satisfactorily completed the prescribed training.**

20.0 DISCIPLINE

20.1 Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the Institution.

20.2 Any act of indiscipline of a student, reported to the Dean (Students), will be referred to a Discipline and Welfare Committee, nominated by the Vice-Chancellor, for taking appropriate action.

21.0 ELIGIBILITY FOR THE AWARD OF DEGREE

21.1 A student shall be declared to be eligible for the award of the B.Tech. degree provided the student has:

i) successfully completed all the required courses specified in the programme curriculum and earned the number of credits prescribed for the specialization, within a maximum period of 14 semester (12 semesters for lateral entry) from the date of admission, including break of study.

ii) Completed the NCC/NSS/NSO/YRC requirements.

iii) no dues to the Institution, Library, Hostels, NCC, NSS, NSO, YRC and

iv) no disciplinary action pending against him/her.

21.2 The award of the degree must have been approved by the University.

22.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

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Curriculum & Syllabus For B.Tech. Electrical & Electronics Engineering
(Eight Semesters / Full Time)
CURRICULUM

PROGRAMME OBJECTIVES:

- To prepare students to excel in electrical and electronics engineering profession by providing sound theoretical knowledge, practical experience, industrial training and all round development.
- To develop skills for devising and evaluating solutions including design of components, systems, and experiments.
- To provide necessary personality skill development courses and software skills so as to face the challenges posed by core industries and software companies.
- To inculcate self learning capability to enable the students to constantly update themselves with the technological developments.
- To impart skills required to appreciate both technical and non-technical features of other disciplines, in order to deal with the impact of technology in a global and societal context.

SEMESTER - I						
Theory		**L**	**T**	**P**	**C**	**TC**
MA 101	Mathematics - I	3	1	0	4	
EN 101	Technical English	2	2	0	4	
PH 101	Physics - I	3	0	0	3	
CH 101	Chemistry - I	3	0	0	3	
GE 101	Engineering Graphics	2	0	3	3	
GE 105	Fundamentals of Computing	3	0	0	3	
Practicals						
PH 102	Physics Laboratory	0	0	2	1	
CH 102	Chemistry Laboratory	0	0	2	1	
GE 102	Basic Engineering Practice Lab	0	0	3	1	
GE 106	Computer Practice Lab	0	0	3	1	**24**

SEMESTER - II						
Theory		**L**	**T**	**P**	**C**	**TC**
MA 102	Mathematics -II	3	1	0	4	
PH 103	Physics - II	3	0	0	3	
CH 105	Chemistry - II	3	0	0	3	
GE 107	Engineering Mechanics	3	1	0	4	
EE 101	Electric Circuit Analysis	3	1	0	4	
EE 102	Electronic Devices and Circuits	3	0	0	3	
Practicals						
EE 103	Electric Circuits Lab	0	0	3	1	
EN 102	Communication Skills Laboratory - I	0	0	2	1	**23**

SEMESTER - III						
Theory		**L**	**T**	**P**	**C**	**TC**
MA 201	Mathematics -III	3	1	0	4	
CE 281	Fluid Mechanics	3	0	0	3	
ME 281	Applied Thermodynamics	3	0	0	3	
EE 201	Network Analysis and Synthesis	3	1	0	4	
EE 202	Electrical Machines - I	3	0	0	3	
EE 203	Electromagnetic Theory	3	1	0	4	
Practicals						
EE 204	Electrical Machines Lab - I	0	0	3	1	
ME 283	Fluid Mechanics and Thermal Lab	0	0	3	1	
EN201	Communication Skills Laboratory -II	0	0	2	1	**24**

SEMESTER - IV						
Theory		**L**	**T**	**P**	**C**	**TC**
MA 205	Numerical Methods	3	1	0	4	
CS 281	Computer Architecture	3	0	0	3	
EE 206	Electrical Machines - II	3	0	0	3	
EE 207	Transmission and Distribution	3	1	0	4	
GE 201	Environmental Engineering	3	0	0	3	
CS 284	Object Oriented Programming	3	0	2	4	
Practicals						
EE 208	Electrical Machines Lab - II	0	0	3	1	
EC 283	Electronic Devices and Circuits Lab	0	0	3	1	
TP 202	Confidence Building & Behavioural Skills	0	0	2	1	**24**

SEMESTER - V						
Theory		**L**	**T**	**P**	**C**	**TC**
EC 381	Digital Systems and Integrated Circuits	3	0	0	3	
EE 301	Design of Electrical Apparatus	3	1	0	4	
EE 302	Power Electronics	3	0	0	3	
EE 303	Control Systems	3	1	0	4	
EE 304	Power System Analysis	3	1	0	4	
EC 391	Communication Engineering	3	0	0	3	
Practicals						
EE 305	Control System Laboratory	0	0	3	1	
EE 306	Power Electronics Laboratory	0	0	3	1	
TP 301	Career Building and People Skills	0	0	2	1	**24**

SEMESTER - VI						
Theory		**L**	**T**	**P**	**C**	**TC**
EE 307	Bio Medical Engineering	3	0	0	3	
EE 308	Measurements & Instrumentation	3	0	0	3	
EE 309	Power Generation Systems	3	0	0	3	
EC 383	Micro Processors and Micro Controllers	3	0	0	3	
EC 384	Digital Signal Processing	3	1	0	4	
EE 310	Protection and Switch Gear	3	0	0	3	
EE 406	Self Learning Course	$	0	0	#	
Practicals						
EE 311	Measurements & Instrumentation Lab	0	0	3	1	
EC 385	IC & Microprocessor Lab	0	0	3	1	
TP 302	Problem Solving and Thinking Skills	0	0	2	1	
EE 409	Industrial Training	0	0	*	**	**22**

SEMESTER - VII						
Theory		**L**	**T**	**P**	**C**	**TC**
EE 401	Power System Control	3	1	0	4	
MS 081	Essentials of Management	3	0	0	3	
EE 402	High Voltage Engineering	3	0	0	3	
EE 403	Evolutionary Computing	3	0	0	3	
EE 406	Self Learning Course	$	0	0	2	
	Elective - I	3	0	0	3	
	Elective - II	3	0	0	3	
Practicals						
EE 404	Power System Simulation Lab	0	0	3	1	
EE 405	Comprehension	0	0	3	1	
EE 409	Industrial Training	0	0	*	**	**23**

SEMESTER - VIII						
Theory		**L**	**T**	**P**	**C**	**TC**
EE 407	Solid State Drives	3	0	0	3	
EE 408	Power Quality & Energy Conservation	3	0	0	3	
	Elective - III	3	0	0	3	
	Elective - IV	3	0	0	3	
Practicals						
EE 409	Industrial Training	0	0	0	1***	
EE 410	Project	0	0	12	6	**19**

Total Credits : 183

EE 406 SELF LEARNING COURSE

$ A student is expected to do the self learning course on his own, relating to the area of Project work .For discussion and interaction with the project supervisor, one hour per Week is allocated.

The credit for the EE406 Self Learning Course IS "TWO" and it will be accounted in the seventh semester.

- A "Self Learning Course-EE406" on the topic of student's choice has been introduced during VI and VII Semester.
- The course for "Self Learning" shall be relevant to the student's project work.
- The course content and the materials for self learning course shall be decided by the respective supervisor and the Head of the Department and it will be approved by the Dean (Academic).
- A broader choice will be given to the student so that a student is permitted to choose a course in the areas of his/her interest.
- The Self Learning Course shall be introduced as a "Core Course".

EE 409 INDUSTRIAL TRAINING

* Minimum 30 days of Industrial Training, in a single slot, is required.

** The credit to be awarded for "EE409 Industrial Training course is "one"

*** The credit for the successful completion of "EE409 Industrial Training" course will be awarded in the eight semester, while a student can complete the course in a single slot between 6th and 8th semester Vacation.

- The students of EEE will be allowed to undergo training only in reputed Companies/research labs/design centres.
- For the same, a student needs to get an approval from the Head of the Department, before applying for the industrial training.
- The evaluation for the industrial training programme shall be done by the company /research labs/design centres.
- The evaluation format will be prepared by the Department and it will be sent to the Company/research labs/design centres offering industrial training.
- After the successful completion of " EE409 Industrial Training", the student will be awarded "ONE CREDIT" and the same will be accounted in the 8th Semester [Grade Point Average(GPA)].
- A report as the industrial training along with the industry certificate needs to be submitted to the department.

LIST OF ELECTIVE COURSES

Group I					
EE025	EHV AC & DC Transmission Engineering	3	0	0	3
EE026	Power System Dynamics	3	0	0	3
EE027	Power System Transients	3	0	0	3
EE028	Solid State Relays	3	0	0	3
EE029	Advanced Control Systems	3	0	0	3
Group II					
EE030	Special Electrical Machines	3	0	0	3
EE031	CAD of Electrical Apparatus	3	0	0	3
EE032	Software for Circuit Simulation	3	0	0	3
EE033	Intelligent Controllers	3	0	0	3
EE034	Flexible AC Transmission Systems	3	0	0	3
Group III					
EE035	Visual Languages and its appln to Electrical Engg.	3	0	0	3
EE036	Robotics and Automation	3	0	0	3
EE037	Embedded System Design	3	0	0	3
EE038	Fiber Optics and Laser Instruments	3	0	0	3
EE039	Micro Electro Mechanical Systems (MEMS)	3	0	0	3
EE040	VLSI Design	3	0	0	3
Group IV					
EE041	System Identification and Adaptive Control	3	0	0	3
EE042	Operation Research	3	0	0	3
EE043	Data Base Management systems	3	0	0	3
EE044	Total Quality Management	3	0	0	3
EE045	Internet Technology	3	0	0	3
EE046	Mobile Communication	3	0	0	3

SEMESTER - I

MA 101	MATHEMATICS - I (Common to all branches)	L	T	P	C
		3	1	0	4

UNIT I MATRICES 12

Rank of a Matrix - Consistency of Linear System of Equations - Eigen Value Problems - Eigen Values and Eigen vectors of a real matrix, Engineering Applications - Characteristic Equations - Properties of Eigen Values and Eigen Vectors - Cayley Hamilton Theorem (without proof) Similarity Transformation (Concepts only) - Orthogonal matrices - orthogonal transformations of a symmetric matrix to diagonal form - deduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

Direction cosines & ratios - angle between two lines - equations of a plane - equations of a straight line - coplanar lines - shortest distance between skew lines - sphere - tangent plane - plane section of a sphere - orthogonal spheres.

UNIT III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature - Cartesian and polar coordinates - centre and radius of curvature - circle of curvature - involutes & evolutes - envelopes - properties of envelopes and evolutes, evolutes as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES 12

Functions of two variables - partial derivatives - total differential - Taylor's expansion - maxima and minima - constrained maxima and minima - Lagrange's multiplier method - Jacobians - differentiation under integral sign.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Simultaneous first order linear equations with constant coefficients - Linear equations of second order with constant and variable coefficients - homogeneous equations of Euler type - equations reducible to homogeneous form - method of variation of parameters.

TOTAL : 60

REFERENCES:

1. Kreyszig .E., " Advanced Engineering Mathematics " (8th edition), John Wiley and Sons (Asia) Pte Ltd., Singapore, 2001

2. Kandasamy,P., Thilagavathy.K, and Gunavathy.K., "Engineering Mathematics" Volume I (Revised Edition) S.Chand &co , New Delhi, 2000

3. Rajasekaran.S., Chandrasekaran A., "Engineering Mathematics" Volume I (Revised Edition) Dhanam publishers, Chennai

4. Veerarajan.T., "Engineering Mathematics " Tata Mc Graw Hill Publishing Co. New Delhi

5. Venkataraman. M.K., "Engineering Mathematics - First Year" National Publishing Company. Chennai.

EN 101	TECHNICAL ENGLISH (Common for all branches)	L T P C 2 2 0 4

OBJECTIVES:

- To enable students to give instructions and directions.
- To enable students to receive messages.
- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate the reading habit and to develop effective reading skills
- To enable students write letters and reports effectively in formal and business situations.
- To help learners improve their vocabulary and to enable them to use words appropriately in different contexts.

UNIT 1 **12**

Focus on Language: Use of Suffixes, Change of word from one form to another, Tenses- simple present, present continuous, Interchange of voices, Impersonal passive form.

Reading: Skimming & Scanning using different texts.

Listening: Listening for general content.

Speaking: Pronunciation and accent.

Writing: Principles of writing, Paragraph writing, Definition, Description.

Suggested Activities: Changing the grammatical function of words using suffixes, Providing different contexts for using tenses, Changing voices (Active to Passive form)Rewriting in impersonal passive form.

UNIT II **12**

Focus on Language: Word formation with prefixes, Framing 'Wh'-questions-Yes-No questions and Question tags, Adjectives, Comparative Adjectives.

Reading: Scanning for specific information and making inferences.

Listening: Note-making

Writing: Comparison and Contrast, Bar charts

Speaking: Conversations- Eliciting information.

Suggested Activities: Changing the grammatical function of words using prefixes, Questions Yes/No types, Question tags, Using appropriate Comparative Adjectives, Role-play activities for eliciting information.

UNIT III **12**

Focus on Language: Tenses- simple past, past perfect, Phrasal verbs, SV concord, Rules of spelling, Compound nouns, Vocabulary.

Reading : Analyzing and interpreting graphics information, Making inferences, Reading comprehension, Organization of information in a paragraph

Listening: Listening comprehension (multiple choice questions)

Writing: Use of discourse markers, Sequencing jumbled sentences, Letter to the editor, Letter of invitation.

Speaking: Debates.

Suggested activities: Providing context for tenses, Fill in the blanks with suitable phrasal verbs, Correction of sentences, Editing, Expansion of Compound nouns, Multiple choice, Gap filling, Conversations, Persuasive speaking, Drawing inferences.

UNIT IV **12**

Focus on Language: Use of imperatives, Prepositions, Adverbs, Use of modals, Tenses- Simple future tense and 'If' conditionals

Reading: Extensive reading- reading general texts.

Listening: Intensive listening, guessing the main idea based on the contextual meaning, multiple choice,

Writing: Cause and effect, Purpose and function expressions, Instructions and Recommendations

Speaking: Future plans,(career topic oriented).

Suggested activities: Rewriting sentences using imperatives , fill in the blanks with suitable prepositions, adverbs, use of modal verbs in sentences , Using tenses in different contexts, Use of 'If' conditionals, Giving cause & effect

statements to be linked with expressions like as, since, because, etc, using expressions of 'purpose &function' &linking sentences, Using expressions related to recommendations & writing recommendations. Students may be asked to read the book suggested for extra reading and submit assignments. Assignments can be in the form of review, criticism, appreciation etc.

UNIT V **12**

Focus on Language: Numerical adjectives, Using vocabulary in different contexts.

Reading - Reading between the lines understanding implied meanings in the context.

Listening -Listening for specific information, taking messages - memos

Writing- Business letters - quotations, placing an order, complaint, check list.

Speaking - Group Discussion - Problems and Solutions

Suggested activities: Rewriting sentences as numerical adjectives, Technical vocabulary, Identifying an issue and discussing the solution, Writing formal letters - Calling for quotations, Placing an order, Complaint- Writing recommendations, Instructions- Preparing a check list, Listening to conversations & taking down messages.

(Total 60)

TEXT BOOK

Department of Humanities & Social Sciences, Anna University, " English For Engineers & Technologists" combined edition (volumes 1 & 2).

REFERENCES

1. Andrea J. Rutherford, 'Basic Communication Skills for Technology' second edition. Pearson Education.
2. P.K.Dutt, G. Rajeevan and C.L.N. Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
3. Krishna Mohan and Meera Banerjee, ' Developng Comminication Skills', Macmillan India Ltd., (reprinted 1994-2007)

Extensive Reading

1. A.P.J. Abdul Kalam with Arun Tiwari, ' Wings of Fire' An Autobiography. University Press (India) Pvt. Ltd. 1999, 30th impression 2007.

PH 101	PHYSICS-I	L	T	P	C
		3	0	0	3

UNIT I CRYSTAL PHYSICS **9**

Introduction - Space lattice - unit cell - Bravais lattices - Miller Indices for cubic crystals - Inter planar spacing in cubic lattice - simple crystal structures - SC, BCC, FCC and HCP structures - atomic radius, coordination number, packing factor calculation - relation between density and lattice constant - crystal imperfections.

UNIT II QUANTUM PHYSICS **9**

Black body radiation - Planck's theory of radiation - deduction of Wien's displacement law and Rayleigh-Jeans law from Planck's theory - photo electric effect - Laws of photoelectric effect - Einstein's photoelectric equation - solar cell -Dual nature of matter - De Broglie's wavelength - physical significance of wave function - Schroedinger wave equation - time independent and time dependent wave equation - particle in one dimensional box.

UNIT III WAVE OPTICS **9**

Conditions for Interference (no derivation) - principle, construction and working of Michelson's interferometer - types of fringes - applications of Michelson's interferometer - determination of wavelength of monochromatic light and thickness of a thin material - polarization - double refraction - Theory of plane polarized, circularly polarized and elliptically polarized light - Quarter wave plate, Half wave plate - production and detection of plane, circularly and elliptically polarized lights -photo elasticity - photo elastic effect - stress optic law - isoclinics and isochromatic fringes(no derivation) - photo elastic bench.

UNIT IV ULTRASONICS AND NDT **9**

Ultrasonics - production - magnetostriction and piezo electric methods - Applications - Acoustical grating - SONAR - depth of sea - measurement of velocity of blood flow and movement of heart - NDT methods - Liquid penetrant method - ultrasonic flaw detector - X-ray radiography and fluoroscopy - Thermography.

UNIT V LASER AND FIBRE OPTICS **9**

Characteristics of laser light - Einstein's coefficients (A&B) - Nd:YAG laser - He-Ne laser - CO_2 laser - homo and hetero junction semiconductor lasers - applications -material processing and holography (construction and

reconstruction of hologram) and CD-ROM - Optical fibre - principle of propagation of light in optical fibers - single and multimode fibres - step index and graded index fibres - applications - fibre optic communication system (block diagram only) - fibre optic sensors (displacement and pressure sensors (qualitative).

TOTAL :45

TEXT BOOKS:

1. Avadhanulu M.N., Engineering Physics,1st Edition, S.Chand & Company Ltd., New Delhi, 2007.

2. Palanisamy P.K., Physics for Engineers, Vol.1, 2nd Edition, Scitech Publications, Chennai, 2003.

REFERENCES :

1. Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.

2. Uma Mukherji, Engineering Physics, Narosa Publishing House, New Delhi, 2007.

CH 101	CHEMISTRY- I	L	T	P	C
		3	0	0	3

UNIT I WATER TECHNOLOGY **9**

Introduction- Impurities present in water-Hardness-Types of Hardness-Estimation of Hardness (EDTA method)-Alkalinity-Estimation of Alkalinity-Disadvantages of hard water in industries - conditioning methods - external treatment methods - zeolite and ion exchange methods - internal treatment (colloidal, phosphate, calgon, carbonate methods) - drinking water standards (BIS) - treatment of domestic water (screening, sedimentation, coagulation, filtration, disinfection - by chlorination, UV treatment, ozonization).

UNIT II ENGINEERING MATERIALS **9**

Abrasives - Moh's scale of hardness - natural abrasives (diamond, corundum, emery, garnets and quartz) - artificial abrasives (silicon carbide, boron carbide) - Refractories : characteristics - classification (acid, basic and natural refractories) - properties (refractoriness, refractoriness under load, dimensional stability, porosity - thermal spalling) - manufacture of refractories (general methods) - preparation, properties and uses of high alumina bricks, magnesite and zirconia bricks only - lubricants and lubrication - functions - classification with examples - properties (viscosity index, flash and fire point, oiliness, carbon residue, aniline point, cloud and pour point) - greases (calcium based, sodium based, lithium based only) - solid lubricants - graphite and molybdenumsulphide-Adhesives-Requirements-Classification-Adhesive action-Factors influencing adhesive action

UNIT III ELECTRO CHEMISTRY **9**

Galvanic cells - reversible and irreversible cells - emf and its measurements - single electrode potential - standard electrodes (H2 & calomel electrodes) - electrochemical series - Nernst equation - problems - metal - metal ion electrode - metal - metal insoluble salt electrode - glass electrode - determination of pH using glass electrode - application of emf measurements - problems - concentration cells - applications - problems - ion selective electrodes - Kohlrausch law of independent migration of ions - applications - conductometric titrations - polarization - overvoltage - decomposition potential.

UNIT IV FUELS AND COMBUSTION **9**

Classification of fuels (solid, liquid and gaseous) comparison - coal varieties - analysis of coal, proximate (moisture, volatile mater, ash content & carbon content) - significance - ultimate analysis (carbon, hydrogen, nitrogen, ash &

oxygen) - significance - coke manufacture (Otto-Hoffman by product coke oven method) - characteristics of metallurgical coke - petroleum - refining - fractions - composition and uses - cracking - thermal and catalytic (fixed bed & fluidized bed) - synthetic petrol (polymerization - thermal and catalytic methods) - Fischer - Tropsch method - Bergius process - knocking - octane number - improvement of antiknock characteristics - diesel engine fuel - cetane number - gaseous fuels - production composition and uses of producer gas, water gas and natural gas - combustion - gross and net calorific values - theoretical calculation of calorific values (Dulong's formula) - calculation of minimum requirement of air (simple calculations) - explosive range, spontaneous ignition temperature - flue gas analysis - Orsat apparatus.

UNIT V SPECTROSCOPY **9**

Electromagnetic spectrum - absorption of radiation - electronic transition - vibrational transition - rotational transition - intensities of spectral lines - Beer - Lambert's Law -colorimetric analysis - estimation of concentration of a solution by colorimetry - flame photometry - theory, instrumentation (block diagram only) and application - visible & UV spectroscopy - principles, instrumentation (block diagram only) and simple applications - IR spectroscopy - simple applications only.

TOTAL : 45

TEXT BOOKS:

1. Puri B.R., Sharma L.R. and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., Jalandhar, 2000.

2. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai & Sons, New Delhi. 2001.

REFERENCES :

1. Bahl B.S., Tuli G.D., and Arun Bahl, Essentials of Physical Chemistry, S.Chand & Company Ltd., New Delhi, 2004.

2. Kuriacose J.C. & Rajaram J, Chemistry in Engineering & Technology, Vol. 1, Tata McGraw-Hill publishing company, New Delhi, 1996.

GE 101	ENGINEERING GRAPHICS (Common to All Branches)	L T P C 2 0 3 3

BASICS **3**

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.

UNIT I CURVES AND ORTHOGRAPHIC PROJECTION **9**

Conic sections : ellipse, parabola, hyperbola

Special curves : Cycloid, epicycloid, hypocycloid, involutes, helix

Orthographic projection - first angle, third angle projections, principle, free hand sketching of 3D to 2D as per first angle projection.

UNIT II PROJECTION OF POINTS, STRAIGHT LINES AND PLANE SURFACES **12**

Orthographic projection of points, straight lines in first quadrant - true length and true inclinations - traces. Projection of plane lamina in first quadrant.

UNIT III PROJECTION OF SOLIDS **12**

Projection of solids : prism, pyramid, cone, cylinder - auxiliary projection.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **12**

Section of solids : prism, pyramid, cone, cylinder, and sphere - sectional view - true shape .Solids in simple position and cutting plane inclined to one reference plane only. Development of surface of truncated solids : prism, pyramid, cone cylinder - frustum of cone and pyramid.

UNIT V PICTORIAL PROJECTIONS **12**

Isomertic scale - Isometeric projection,view of prism, pyramid, cylinder , cone , frustums and truncated solids. Perspective projection of prism, pyramid, cylinder, frustums - Visual ray method and Vanishing point method. Commands and demonstration of Drafting packages.

TOTAL : 60

TEXT BOOK:

1. N.D. Butt, Engineering Drawing

REFERENCES:

1. K.V. Natarajan, Engineering Drawing & Graphics, Nineteenth Edition, Dhanalakshmi publishers, Chennai-90.

2. Venugopal. K, Engineering Graphics, Sixth Edition, New Age International (P) Ltd., Publication, Chennai.

GE 105	FUNDAMENTALS OF COMPUTING	L	T	P	C
	(Common to CSE, IT, ECE, ICE, EEE, CIVIL)	3	0	0	3

UNIT I BASICS OF COMPUTER AND INFORMATION TECHNOLOGY 8

Digital Computer fundamentals - Block diagram of a computer-Component of a computer system - Hardware and software definitions - Categories of software - Applications of computers - Role of Information technology -Internet Services Types and generation of programming languages - algorithm - flow chart - pseudo code - Top down approach - refinement - one-in one-out control structures - Development of solutions for simple problems using flow charts and pseudo code.

UNIT II BASIC ELEMENTS OF C 9

Introduction to C - Lexical elements of C - types - their representation - Operators and Expressions - Operator precedence - and associatively of operators-Input and Output functions - simple computational problems.

UNIT III DECISION MAKING 10

Control statements - branching, looping, nested control structures, switch, break, continue, goto statements - Problems using control structures.

Functions and Program structures:

Prototypes and Functions - Declaring defining and accessing functions - Parameter passing methods -storage classes -auto, extern, static, and register- Library functions. - Programs using functions - recursion.

UNIT IV ARRAYS 8

Defining and processing arrays - Passing arrays to functions - Multi - dimensional arrays - strings and basic operations on strings - enumerated data types - Programs using simple sorting, searching.

UNIT V POINTERS 10

Pointer concept - Declarations - Accessing variable through pointer-Structures - User defined data types

File handling

File pointer - Opening and closing of file - Creating, Processing and Updation on files - simple file handling programs.

TOTAL : 45

TEXT BOOKS

1. Jeri R. Hanly and Elliot B. Koffman, "Problem Solving and Program Design in C", Fifth Edition, Pearson Education (2009)

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, "The C programming Language", Pearson Education Inc. (2005).

2. Behrouz A. ForouZan and Richard. F. Gilberg, "A structured Programming Approach using C", II Edition, Brooks-Cole Thomson Learning Publications, 2001.

3. V Rajaraman, "Computer Basics and C Programming", PHI (2008)

4. E.Balagurusamy,"Computing Fundamentals and C Programming", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.

TOTAL : 45

PH 102	PHYSICS LABORATORY (Common to all branches)	L T P C 0 0 2 1

LIST OF EXPERIMENTS :

1. Torsional Pendulum - Determination of rigidity modulus of wire and moment of inertia of disc.
2. Non-Uniform Bending - Young modulus determination
3. Viscosity - Determination of co-efficient of Viscosity of liquid by Poiseuilles flow.
4. Lee's disc - Determination of thermal conductivity of a bad conductor.
5. Air wedge - Determination of thickness of a thin wire.
6. Spectrometer - Dispersive power of a prism.
7. Spectrometer - Determination of wavelength of Hg source using Grating.
8. (i) Determination of wavelength of Laser using Grating
   (ii) Particle size determination
   (iii) Determination of Numerical Aperture and Acceptance angle of an optical Fiber
9. Ultrasonic Interferometer-Velocity of Ultrasonic waves in a liquid and compressibility of the liquid
10. Band gap determination of a semiconductor

CH 102	CHEMISTRY LABORATORY (Common to all branches)	L T P C 0 0 2 1

I. WEIGHING AND PREPARATION OF STANDARD SOLUTIONS

1. Preparation of molar and normal solutions of the following substances - oxalic acid, sodium carbonate, sodium hydroxide, hydrochloric acid.
2. Preparation of buffer solutions: borate buffer, phosphate buffer using Henderson equation.

II. WATER ANALYSIS

3. Determination of total hardness, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content by Winkler's method.
5. Determination of alkalinity in a water sample.
6. Determination of chloride content of water sample by argentometric method.

III. pH

7. To find out the strength of given hydrochloric acid by sodium hydroxide.

IV. CONDUCTOMETRY

8. Conductometric titration of mixture of acids.
9. Conductometric precipitation titration using $BaCl_2$ - Na_2SO_4.

V. POTENTIOMETRY

10. Redox titration - Iron Vs. dichromate.

VI. SPECTROPHOTOMETRY

11. To determine the iron content of an unknown solution (1,10-phenanthroline / thiocyanate method)

VII. FLAME PHOTOMETRY

12. To determine sodium and potassium in water

VIII VISCOMETRY

13. Determination of molecular weight of a polymer.

Total : 45

REFERENCES :

1. A Text of Quantitative Inorganic Analysis, A.I.Vogel, ELBS, London.

2. Experiments in Physical Chemistry, D.P. Shoemaker and C.W. Garland, McGraw-Hill, London.

GE 102	BASIC ENGINEERING PRACTICE LAB (Common to all branches of EEE/ECE/ ICE/CSE/IT)	L 0	T 0	P 3	C 1

Civil Engineering **9**

Pipe line to a Washing Machine

Making a Half Lap Joint

Making a Mortise & Tenon Joint

Mechanical Engineering Practice **9**

1. Making a Butt Joint
2. Making a Lap Joint
3. Facing, Turning, Chamfering and Drilling using Lathe

Electrical Engineering Practice **15**

1. Basic household wiring using switches, fuse, indicator-lamp.
2. Preparation of wiring diagrams.
3. Stair case light wiring, Tube- light wiring.
4. Study of iron-box, fan with regulator, emergency lamp.

Electronic Engineering Practice **12**

1. Soldering simple electronic circuits and checking continuity.
2. Assembling telephone circuit, FM radio, low voltage power supplies on a small PCB.
3. Testing telephone circuit, fm radio, low voltage power supplies on a small PCB.

TOTAL: 45

GE 106	COMPUTER PRACTICE LAB (Common to all branches)	L T P C 0 0 3 1

LIST OF EXPERIMENTS

UNIT I WORD PROCESSING AND SPREAD SHEET

1. Word Processing
   a. Document creation, Text formatting, Searching.
   b. Table creation, Table formatting.
2. Spread Sheet
   a. Formula - formula editor.
   b. Chart - Line, XY, Bar and Pie.
   c. inclusion of Picture and graphics
   d. Sorting and Import / Export features.

UNIT II C PROGRAMMING

3. Data types, Expression Evaluation, Condition Statements.
4. Functions, Recursion and parameter passing mechanisms.
5. Arrays

UNIT III

6. Structures and Unions
7. Pointers and Functions
8. File Processing
9. Dynamic allocation, Linked List

TOTAL : 45

SEMESTER - II

MA 102	MATHEMATICS - II	L	T	P	C
	(Common to all branches except CSE & IT)	3	1	0	4

UNIT I MULTIPLE INTEGRALS 12

Double integration - Cartesian and Polar coordinates - change of order of integration - area as a double integral - triple integration in Cartesian coordinates - change of variables between Cartesian and polar coordinates and cylindrical, spherical polar coordinates.

UNIT II VECTOR CALCULUS 12

Gradient , divergence and curl - line , surface and volume integrals - Green's, Gauss Divergence and Stoke's theorems (without proof) - verification and evaluation of integarals using them.

UNIT III ANALYTIC FUNCTIONS 12

Function of a complex variable - Analytic function - necessary conditions - Cauchy-Riemann equations in Cartesian coordinates - sufficient condition (Proof not included) -properties of analytic function - determination of harmonic conjugate by Milne-Thomson method - conformal mapping (w= a+z, az, 1/z, z^2) and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Statement and application of Cauchy's theorem - Cauchy's integral formula - Taylor and Laurent expansion - singularities classification - residues - Cauchy's residue's theorem - contour integration - unit circle and semi circular contours (excluding poles on real axis)

UNIT V LAPLACE TRANSFORM 12

Laplace transform - sufficient condition - transforms of elementary functions- basic properties- inverse transforms -derivatives and integral of transforms- transforms of derivatives and integrals- convolution theorem -transform of periodic functions - application to solution of linear ordinary differential equations - second order with constant coefficients, Simultaneous equations.

TOTAL : 60

REFERENCES :

1. Kreyszig .E., " Advanced Engineering Mathematics " (8th edition), John Wiley and Sons (Asia) Pte Ltd., Singapore, 2001.

2. Kandasamy,P., Thilagavathy, and Gunavathy. k., "Engineering Mathematics" Volume II (Revised Edition) S.Chand & co , New Delhi, 2000.

3. Rajasekaran.S., Chandrasekaran A., "Engineering Mathematics" Volume II (Revised Edition) Dhanam publishers, Chennai.

4. Veerarajan.T., "Engineering Mathematics "Tata McGraw - Hill Publishing Co. New Delhi.

5. Venkataraman. M.K. "Engineering Mathematics - First Year" National Publishing Company. Chennai.

PH 103	PHYSICS II	L	T	P	C
	(Common to Mechanical, EEE, ICE, Civil and Polymer)	3	0	0	3

UNIT I CONDUCTING MATERIALS 9

Classical free electron theory of metals - Electrical conductivity and thermal conductivity -Wiedmann Franz law (derivation) - Lorentz number - Drawbacks of classical theory - quantum free electron theory and its importance - Energy distribution of electrons in metals - Fermi distribution function - Density of energy states and carrier concentration in metals (derivation) - Fermi energy - Classification of solids into conductors, semiconductors and insulators on the basis of Band theory (qualitative)

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductors - Elemental and compound semiconductors - Drift current and diffusion current - carrier concentration (derivation) - Fermi energy - Variation of Fermi energy level with temperature - Mobility and electrical conductivity - Band gap determination - Extrinsic semiconductors - carrier concentration in n-type and p-type semiconductor (derivation) - Variation of Fermi level with temperature and impurity concentration - Variation of Electrical conductivity with temperature - Hall effect - Experiment and applications of Hall effect

UNIT III DIELECTRIC MATERIALS 9

Dielectric constant (ε_r) - Electric susceptibility (x) - Different types of dielectric polarization: electronic, ionic, orientational and space charge polarization - the frequency and temperature dependence of polarization - Internal field and deduction of Clausius-Mossoti's equation (derivation) - Dielectric loss - Types of dielectric breakdown - uses of dielectric materials (capacitor & transformer).

UNIT IV SUPERCONDUCTING MATERIALS AND NEW ENGINEERING MATERIALS 9

Superconductivity - Meissner effect - Critical magnetic field - type I and type II superconductors - High temperature superconductors - Applications of superconductors: SQUID and magnetic levitation - Nonlinear optics - Harmonic generation - Optical mixing - Optical phase conjugation - Solitons - Metallic glasses - properties and applications - Shape Memory Alloys - properties and applications - Nano phase materials - properties and applications

UNIT V THERMAL PHYSICS **9**

Mode of heat transfer, coefficient of Thermal conductivity, Thermal diffusivity, Rectilinear flow of heat along a bar (derivation) - Radial flow of heat, spherical shell method (derivation) - determination of thermal conductivity of rubber and powder materials - conduction through compound media - Thermal insulation in the buildings - Practical application of heat conduction and convection - conductivity of the earth's curst and age of the earth - Ventilation - Radiators - Central heating - Removal of generated heat in automobiles - gas filled electric lamps.

TOTAL : 45

TEXT BOOKS:

1. Avadhanulu M.N., Engineering Physics,1st Edition, S.Chand & Company Ltd., New Delhi, 2007.
2. Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2003.
3. Brijlal and Subrahmanyam. N., Heat & Thermodynamics, New edition, S. Chand & Company Ltd., New Delhi, 2007.

REFERENCES :

1. Charles Kittel, Introduction to solid state physics, 7th Edition, John Wiley & sons (ASIA) Pvt. Ltd.
2. Uma Mukherji, Engineering Physics, Narosa Publishing House, New Delhi, 2007.

CH 105	CHEMISTRY II	L	T	P	C
	(Common to EEE, ECE, ICE, CSE, IT)	3	0	0	3

UNIT I PHOTO CHEMISTRY **9**

Photochemical reactions - laws of photo chemistry - Grotthus - Draper Law - Stark - Einstein Law - quantum efficiency - photochemical decomposition of HI and HBr -quantum yield determination - chemical actinometer - energy transfer in photochemical reactions - photosensitization and quenching (example - photo synthesis in plants) - chemiluminescence - photophysical processes - fluorescence, phosphorescence - photo inhibitors - radiation chemistry - radiolysis - principles - radiation dosimetry (units, Fricke dosimeter)

UNIT II POLYMER CHEMISTRY **9**

Preparation, properties and uses of PVC, phenol - formaldehyde and urea formaldehyde - effect of heat on polymers - polymer blends - ABS plastics - polycarbonates - polyamides - polymer alloys - ABS - PC alloy, ABS-PVC alloy - vulcanization of rubber - blending of rubber with plastics - laminates and fibre reinforced plastics - chemical structure and electronic behavior of conducting polymers - semi conducting properties of organic polymers containing metal groups such as poly ferrocenes - optical fiber - definition, principles and structure - characteristics of optical fibre - photo resist optical fiber - advantages of optical fibre.

UNIT III CORROSION AND ITS INHIBITION **9**

Corrosion - causes of corrosion - principles of chemical corrosion - Pilling - Bedworth rule - principles of electrochemical corrosion - factors influencing corrosion - types of corrosion - galvanic corrosion - differential aeration corrosion - stress corrosion - soil corrosion - pitting corrosion - water line corrosion - corrosion control - cathodic protection - sacrificial anode - selection of materials and proper designing - corrosion inhibitors - anodic and cathodic inhibitors - protective coatings - electroplating - electrodelessplating.

UNIT IV ENERGY SOURCES AND ENERGY STORING DEVICES **9**

Nuclear fission process - characteristics of nuclear fission - chain reactions - nuclear energy - nuclear reactors - light water nuclear power plant - batteries - introduction - primary and secondary batteries - dry cells - alkaline batteries, lead acid storage cell, nickel - cadmium cell, lithium battery - fuel cell - hydrogen - oxygen fuel cell - photogalvanic cell.

UNIT V NON CONVENTIONAL ENERGY SOURCES 9

Introduction - Commercial - Conventional energy sources - non-conventional energy sources - renewable energy sources - Solar Energy - Working-Application -Photovoltaic electric conversion - solar cooking - solar production of Hydrogen - Solar green house - Wind Energy - basic components of wind energy -conversion system -advantages - Disadvantages - applications.

TOTAL: 45

TEXT BOOKS :

1. Jain P.C. and Renuka Jain, Engineering Chemistry, Dhanpat Rai Pub., Co. (P) Ltd., New Delhi, 2002.
2. Puri B.R., Sharma C.R. and Madan S. Pathania, Principles of Physical Chemistry, Shoban Lal Nagin Chand and Co., 2000.

REFERENCES :

1. Wang M.N., Polymers for electronic and photonic applications, Wiley New York, 1994.
2. Bahl B.S., Tuli G.D. and Arun Bhal, Essentials of Physical Chemistry, S.Chand & Co. Ltd., New Delhi, 2003.
3. C.D. Roya, "Non Conventional Energy Sources"

GE 107	ENGINEERING MECHANICS (Common to all Branches)	L T P C 3 1 0 4

UNIT I BASICS & STATICS OF PARTICLES **12**

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces - Vectors - Vectorial representation of forces and moments - Vector Algebra and its Physical relevance in Mechanics- Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions - Examples

UNIT III PROPERTIES OF SURFACES AND SOLIDS **12**

Determination of Areas and Volumes - First moment of area and the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Physical relevance - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Mass moment of inertia - Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle - Relation to area moments of inertia.

UNIT IV DYNAMICS OF PARTICLES **12**

Review of laws of motion - Newton's law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.

Introduction to vibrations - Single degree of freedom systems - with and without damping

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS **12**

Frictional force - Laws of Coloumb friction - simple contact friction - Rolling

resistance - Belt friction Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion.

TOTAL: 60

TEXT BOOK :

1. Beer,F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers, Dynamics & Statics", Third SI Metric Edition, Tata McGraw-Hill International Edition, 2001.

REFERENCES :

1. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000

2. Irving H. Shames, Engineering Mechanics - Statics and Dynamics, IV Edition - Pearson Education Asia Pvt. Ltd., 2003

EE 101 ELECTRIC CIRCUIT ANALYSIS

L	T	P	C
3	1	0	4

UNIT I DC CIRCUIT ANALYSIS **10**

Basic components and Electric Circuits: Charge, Current, Voltage and Power, Voltage and Current Sources, Ohm's Laws; Voltage and Current laws: Kirchoff's Current Law, Kirchoff's Voltage Law, Series and Parallel Connected Independent Sources, Resistors in Series and Parallel, Voltage and Current Division; Basic Nodal and Mesh analysis: Nodal analysis, Mesh analysis

UNIT II NETWORK THEOREMS **8**

Useful Circuit Analysis Techniques: Linearity and Superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Reciprocity, Tellegen's theorems. Delta- Wye C onversion.

UNIT III SINUSOIDAL STEADY STATE ANALYSIS **9**

Sinusoidal Steady-State Analysis: Characteristics of Sinusoids, The Complex Forcing Function, The Phasor, Phasor Relationships for R, L And C, Impedance and Admittance, Nodal and Mesh Analysis, Phasor Diagrams: Ac Circuits Power Analysis: Instantaneous Power, Average Power, Apparent Power and Power Factor, Complex Power.

UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS **9**

Basic RL and RC Circuits: The Source- Free RL Circuit, The Source- Free RC Circuit, The Unit-Step Function, Driven RL Circuits, Driven RC Circuits; Frequency Response: Parallel Resonance, Series Resonance.

UNIT V COUPLED CIRCUITS AND 3 PHASE CIRCUITS **9**

Magnetically coupled circuits: Self and Mutual inductance, Analysis of coupled circuits, Dot rule for Coupled Circuits, Equivalent circuit of Coupled Circuits, Coupled circuits in Series and Parallel, Three Phase Circuits: Generation of three Phase Voltages, Star and Delta Connections, Relation between Phase and Line values, Balanced Three Phase Loads, Three phase power measurement by two wattmeter method, Unbalanced loads.

TOTAL : 45

TEXT BOOK:

1. William H.Hayt, Jr.Jack E.Kemmerly, Steven M.Durbin, ?Engineering Circuit Analysis?, Sixth Editions, Tata McGraw- Hill Edition, 2002.

REFERENCES :

1. David E.Johnson, Jonny R.Johnson, John L.Hilburn, "Electric Circuit Analysis", Second Edition, Tata McGraw- Hill 2003.

2. K.V.V.Murthy, M.S.Kamath," Basic Circuit Analysis", Jaico Publishing House, 1999.

3. M.Arumugam, N.Premakumaran, Electric Circuit Theory, Khanna Publishers, 2006. Sudakar and Shyam Mohan, "Circuits And Networks" Tata McGraw-Hill, 2004.

EE 102 ELECTRONIC DEVICES AND CIRCUITS

L	T	P	C
3	0	0	3

UNIT I RECTIFIERS, FILTERS AND REGULATORS **9**

Half wave rectifier, ripple factor, full wave rectifier, harmonic components in a rectifier circuit, inductor filter, capacitor filter, L section filter, P section filter, Multiple L section and P section filters, Comparison of filters in terms ripple factor. Simple regulator circuits. Series and shunt regulators.

UNIT II TRANSISTOR AND FET **9**

Junction Transistor, transistor current components, transistor as an amplifier, transistor construction, detailed study of current in transistor, CB, CC and CE input output characteristics, Alpha and Bets relations, JFET characteristics, Small signal model of JFET and MOSFET, Introduction to SCR and UJT.

UNIT III BIASING AND STABILISATION **9**

BJT biasing, DC equivalent model, criteria for fixing operating point, fixed bias, collector to base bias, self bias techniques for stabilization, stabilization factors: S,S', S''. Compensation techniques (compensation against variation in Vbe, Ico), Thermal run away, thermal stability.

UNIT IV AMPLIFIERS AND FEEDBACK AMPLIFIERS **9**

Small signal LF amplifier circuits: h-parameter representation of a transistor, analysis of single stage amplifier using h-parameters: voltage gain, current gain, input impedance and output impedance. Comparison of transistor configuration in terms of Ai, Ri, Av and Ro.

Concept of feedback, classification of feedback transistors, general characteristics of negative feed back amplifiers, effect of feedback on input and output characteristics, voltage series and current shunt feedback amplifiers with discrete components and their analysis.

UNIT V OSCILLATORS **9**

Condition for Oscillations, RC phase shift Oscillators with transistor and FET, Hartley and Colpitts Oscillators, Wein Bridge Oscillator, Crystal Oscillator, Frequency and Amplitude Stability Oscillators, Multivibrators.

TOTAL : 45

TEXT BOOKS:

1. Electronic Devices and Circuits - J Millman, CC Halkias and SathyabrathaJit, Tata Mcgraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits - R L Boylestad and Lois Nashelsky, Pearson/ Prentics Ha;;, 9th Edition, 2006.
3. Electronic Devices and Circuits - T F Bogart Jr., J S Beasley and G Rico, Pearson Education, 6th Ed., 2004.

EE 103	ELECTRIC CIRCUITS LAB	L	T	P	C
		0	0	3	1

List of Experiments:

1. Verification of Kirchoff's Voltage Law.
2. Verification of Kirchhoff's Current Law.
3. Verification of Superposition theorem.
4. Verification of Thevenin's theorem.
5. Verification of Norton's theorem.
6. Verification of Maximum power transfer theorem.
7. Verification of Reciprocity Theorem.
8. Transient Response of RL, RC, RLC circuits.
9. Series Resonance of RLC circuit.
10. Parallel Resonance of RLC circuit.
11. Three phase power measurement by two wattmeter method.

Total = 45

EN 102 COMMUNICATION SKILLS LABORATORY-I

L	P	T	C
0	0	3	1

OBJECTIVES:

- To help students interact with people effectively in various academic and
- Professional situations.
- To prepare students for placement interviews.
- To enable students understand Spoken English in real-life and business
- Situations.
- To develop the writing ability of students by providing them required practice.
- To familiarize students with the words used in both technical and business contexts.

UNITI: USE OF LANGUAGE IN BUSINESS CONTEXT 4

Face to face conversations - Greeting friends and strangers, Introducing, etc., Situational conversations - Asking for and giving information, Agreeing and disagreeing, etc., Telephonic conversations - Preparing to make a telephone call, receiving a telephone call, taking and leaving telephone messages, etc., Buying and selling a product, Making arrangement for meetings.

Unit II: LISTENING IN CONTEXT 10

Listening to monologues and short conversations based on a variety of sources including interviews, telephone calls, face-to-face conversations - listening to people, listening for instructions (business related), followed by two forms of multiple choice tasks and note completion tasks-- Listening to texts lasting three minutes which is generally in the form of an interview or a discussion with two or more speakers, Listening to longer texts in order to listen for clues and prompts relating to purpose.

Unit III: SPEAKING IN CONTEXT 12

Selling a product-- Describing brands and markets- discussing different advertising methods and marketing techniques, Pronunciation - Stress, Word Stress (giving opinion), Sentence Stress (talking about plans, interpretation of meanings), Pitch and Intonation (talking about problems), Role play, Conducting and participating in meetings, Making a telephone call to a supplier, interviewing a company owner, Persuading/Convincing a customer to buy a product.

Unit IV: READING IN CONTEXT **7**

Reading articles from magazines or newspaper- Extracting relevant information, scanning the text for specific information, Cloze passage, Reading mini case studies on corporate situations like launching and marketing a product, customer care, etc.

Unit V: WRITING IN CONTEXT **12**

Writing emails, Inter-office communication -memos, phone messages, Writing a fax, Writing Letters - to express thanks to a host- to express interest in a product, Business Letters - Making Enquiry about a product, Calling for Quotation, Seeking Clarification, Placing an Order and Making a Complaint, Interpretation of data .

Total: 45

REFERENCES.

1. BEC Preliminary, Cambridge University Press, New York. 2002.
2. Bill Mascull . 'Business Vocabulary in Use' Cambridge University Press. Cambridge, 2002.
3. Bill Mascull. 'Business Vocabulary in Use' Advanced. Cambridge University Press. Cambridge, 2004.
4. Comfort, Jeremy. Et.al. 'Speaking Effectively: Developing Speaking Skills for Business English.' Cambridge University Press. Cambridge, 1984.
5. John Seely, 'Oxford Guide to Speaking and Writing'. Oxford University Press, New Delhi, 2004.
6. Leo Jones. 'New International Business English Student's book. Cambridge University Press. 2003.
7. Leo Jones. 'New International Business English' Teachers' book. Cambridge University Press. Cambridge. 2003.
8. Mohan ,Krishna & Meera Bannerji . 'Developing Communication Skills'. Macmillan India Ltd., Chennai. 2001.
9. Norman Whitby, ' Business Benchmark.' Bulat edition. Cambridge University Press, New Delhi. 2006.
10. Richards, Jack.C. 'New Interchange: English for International Communication.' Foundation Books Pvt. Ltd., New Delhi, 2006.
11. Simon Sweeney. 'Communicating in Business' Student's Book. Cambridge University Press. Cambridge , 2003.
12. Simon Sweeney. 'Communicating in Business' Teacher's Book. Cambridge University Press. Cambridge, 2004.

SEMESTER III

MA 201	MATHEMATICS III (COMMON TO ALL)	L	T	P	C
		3	1	0	4

UNIT 1 PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients.

UNIT 2 FOURIER SERIES 12

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine series - Half range cosine series - Complex form of Fourier Series - Parseval's identity - Harmonic Analysis.

UNIT 3 BOUNDARY VALUE PROBLEMS 12

Classification of second order quasi linear partial differential equations - Solutions of one dimensional wave equation - One dimensional heat equation - Steady state solution of two-dimensional heat equation (Insulated edges excluded) - Fourier series solutions in Cartesian coordinates.

UNIT 4 FOURIER TRANSFORM 12

Fourier integral theorem (without proof) - Fourier transform pair - Sine and

Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

UNIT 5 Z -TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform - Elementary properties - Inverse Z - transform - Convolution theorem -Formation of difference equations - Solution of difference equations using Z - transform.

L = 45, T = 15, Total = 60

REFERENCES

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

3. S.Rajasekaran,A.Chandrasekaran "Engineering Mathematics Volume III " Dhanam Publishers, Chennai

4. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.

CE 281 FLUID MECHANICS L T P C
3 0 0 3

OBJECTIVE

- To introduce the students to the properties of fluid, fluid statics, kinematics and dynamics
- To enable them to do simple pipe flow analysis
- To educate them about the working principles, design aspects and performance characteristics of hydraulic machines

UNIT 1: FLUID CONCEPTS AND FLUID PROPERTIES 5

Fluid - definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension.

UNIT 2: FLUID STATICS, KINEMATICS AND DYNAMICS 15

Concept of fluid pressure- Hydrostatic law-Pascal's law- absolute and gauge pressures - pressure and head relationships- measurement of pressure by manometers and pressure gauges. Flow visualization - lines of flow - types of flow - velocity and acceleration - continuity equation (one, two and three dimensional flows)- Equation of streamline - stream function - velocity potential function- flow net-methods of drawing. Fluid dynamics - Energy equation - Euler's equation along a streamline - Bernoulli's equation - applications - Venturi meter, Orifice meter, Pitot tube.

UNIT 3: PIPE FLOW 8

Laminar flow through pipes- Hagen poiseulle's equation - Hydraulic and energy gradient - flow through pipes - Darcy -weisback's equation - pipe roughness - friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission- Flow through nozzles.

UNIT 4: HYDRAULIC PUMPS 9

Definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principle, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps.

UNIT 5: HYDRAULIC TURBINES **8**

Definition and classifications - Pelton turbine - Francis turbine -Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curve for turbines-Governing of Turbines-Synchronous speed.

L=45 T= 0 Total = 45

TEXT BOOKS:

1. Fluid Mechanics and Machinery - M.V.Molykutty, D1 Publications, East Tambaram, Chennai
2. Fluid Mechanics and Machinery- R.K.Bansal, Laxmi Publications
3. Hydraulics, Fluid Mechanics and Fluid Machinery- P.N.Modi and S. M.Seth, Standard Publications

REFERENCES:

1. Fluid Mechanics and Machinery - D. Ramadurgaiah, New Age International Publishers.
2. Fluid Mechanics and Hydraulic Machines - K.K.Rajput, S.Chand And Company
3. Fluid Mechanics and Fluid Machines- Som and Biswas, Tata Mcgraw Hill Company.

ME 281 APPLIED THERMODYNAMICS **L T P C**
3 0 0 3

UNIT 1: SYSTEMS AND LAWS OF THERMODYNAMICS **9**

Closed and open systems-equilibrium - first law -heat and work transfer - second law - Carnot cycle- reversibility - entropy change.

UNIT 2: POWER CYCLES AND INTERNAL COMBUSTION ENGINES **9**

Otto cycle -diesel cycle-dual cycle-Brayton Cycle -air standard efficiency-two stroke and four stroke engines -SI snd CI Engines -Gas turbine operation.

UNIT 3: STEAM BIOLERS AND TURBINES **9**

Steam properties - use of steam tables and charts - steam power cycle-boilers and accessories-boiler testing - layout of thermal power station-steam turbines impulse and reaction turbines -compounding of turbines - simple velocity diagrams.

UNIT 4: AIR COMPRESSORS, REFRIGERATION AND AIR CONDITIONING 9

Reciprocating and rotary compressors-Multistage compressor- work-volumetric efficiency. Vapour compression-refrigeration cycle - applications - air conditioning system layout -selection.

UNIT 5: HEAT TRANSFER **9**

Conduction-plane wall, cylinder, sphere, composite walls-critical insulation thickness-simple fins-convection -free convection and forced convection flow over flat plates and flow through pipes - empirical relations-radiation - black body, grey body radiation exchanges-cooling machines.

L=45 T=0 Total = 45

TEXT BOOK

1. NAG, P.K., 'Engineering Thermodynamics,' Tata McGraw Hill, 1995.
2. Kothandaraman and Domkundwar ,Applied Thermodynamics',
3. Sachdeva., R.C., 'Heat Transfer,' Wiley Eastern Ltd., 1992.
4. T.Roy Choudhury, 'Basic Engineering Thermodynamics, Tata McGraw Hill Publishing , Co. Ltd.,1997.

REFERENCES

1. Ballancy, P.L. ' Applied Thermodynamics, Khanna Publishers.
2. Rai and Sorao, 'Applied Thermodynamics', Satya Prakasam, 1985.

EE 201 NETWORK ANALYSIS AND SYNTHESIS **L T P C**
3 1 0 4

OBJECTIVES:

- To impart basic knowledge on network analysis using Laplace transforms
- To introduce frequency response analysis in networks
- To introduce basic theory about the design of filters

UNIT 1 S-DOMAIN ANALYSIS **6**

S - domain network - driving point and transfer impedances and their properties - transform network analysis - poles and zeros of network functions - time response from pole - zero plots.

UNIT 2 FREQUENCY DOMAIN ANALYSIS **7**

Immittance - loci of RLC networks - frequency response of RLC networks - frequency response from pole - zero - bode plots.

UNIT 3 NETWORK TOPOLOGY **10**

Network graphs, tree and cut - sets - tie set and cut - set schedules - V shift and I shift - primitive impedance and admittance matrices - application to network solutions.

UNIT 4. TWO PORT NETWORK **10**

Characterization of two port networks in terms of Z , Y,H and T parameters - networks equivalents - relations between network parameters - Analysis of T, Ladder ,Bridged - T and lattice networks - transfer function of terminated two port networks.

UNIT 5. ELEMENTS OF NETWORK SYNTHESIS AND FILTERS **12**

Reliability of one port network - Hurwitz polynomials and properties - P. R. functions and properties - synthesis of RL, RC and LC one port networks. Filters and attenuators - design of constant - K, M - derived and composite filters-Qualitative treatment of Active filters - Butterworth and Chebyshev Filters.

L = 45, T = 15, TOTAL = 60

TEXT BOOK

1. Kuo F.F., 'Network Analysis and Synthesis', Wiley International Edition, Second Edition, 1966.

REFERENCES

1. Paranjothi S.R., 'Electric Circuit Analysis', New age International Publishers, Second Edition, 2000.

2. Van Valkenburg, M.E., 'Network Analysis', Prentice - Hall of India Private Ltd., New Delhi, Third Edition, 1974.

3. Sudhakar. A., and Shyammohan, 'Circuits and Networks Analysis and Synthesis' Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1994.

EE 202 ELECTRICAL MACHINES - I L T P C
3 0 0 3

OBJECTIVES

To impart knowledge on

- The constructional details, the principle of operation, prediction of Performance, the methods of testing the transformers.
- To introduce the principles of electromechanical energy conversion in singly and Multiply excited systems.

UNIT 1. INTRODUCTION 6

Constructional features of DC machines-Principle of operation of DC generator-EMF equation-Methods of excitation-No load and Load characteristics of dc generators-Commutation-Armature reaction

UNIT 2. DC MOTOR 10

Principle of operation of DC motor-Torque equation-Speed -Torque characteristics of motors-starting -speed control-Solid state dc drives (Qualitative treatment only)-Applications

UNIT 3. TESTING OF DC MACHINES 6

Parallel operation of DC generators-losses and efficiency-Testing: Brake, Swinburne's and Hopkinson's test

UNIT 4. TRANSFORMERS 8

Principle of operation-Constructional features of single phase and three phase transformers-EMF equation-Transformer on no load and load-Effects of resistance and leakage reactance of the windings-Phasor diagrams-Equivalent circuit -Voltage regulation.

UNIT 5. TESTING AND PARALLEL OPERATION 15

Losses and efficiency-All day efficiency-Testing -Polarity and voltage ratio tests -Open circuit and short circuit tests -Sumpners test-Parallel Operation of single phase and three phase transformers-Auto transformers-Comparison with two winding transformers-Three phase transformer connections.

L = 45 T = 0 Total = 45

TEXT BOOK

Nagrath, I.J. And Kothari, D.P. 'Electric Machines,' Tata McGraw Hill Publishing Company Ltd., 1990.

REFERENCES

1. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umams 'Electric Machinery' McGraw Hill Books Company, 1992.

2. Albert E Clayton and N N Hancock, The performance and Design of Direct current Machines, Oxford and IBH Publishing company PVT.ltd,New Delhi,1990

3. B.L.Theraja and A.K.Theraja, Electrical Technology, Volume.III,

EE 203 ELECTRO MAGNETIC THEORY L T P C
3 1 0 4

OBJECTIVES

To impart knowledge on

- Concepts of electrostatics, electrical potential, energy density and their applications.
- Concepts of magneto statics and its applications.
- Faraday's laws, induced emf and their applications.
- Concepts of electromagnetic waves and Poynting vector.

UNIT 1. ELECTRIC FIELDS 9

Concepts-Coulomb's Law-Electric Field intensity-Electric field due to point charge, line , surface and volume charge distributions-Electric flux density-Gauss theorem-Electric Potential-Potential gradient-Divergence theorem-Poisson's and Laplace equations.

UNIT 2. DIELECTRICS 9

Conductors and dielectrics-Field due to dipoles-Dipole moment-Boundary conditions at Dielectric and conductor surfaces-Capacitor-Capacitance of system of conductors-Electrostatic potential energy associated with different charge distributions-Energy density and pressure in electric fields-Force between charges-Charges in motion-Conduction current -Displacement current-Equation of continuity

UNIT 3. MAGNETIC FIELDS 9

Concepts-Force on a current element - Biot savart's law-Force between current carrying conductors-Torque on closed conductors-Ampere's law- Boundary conditions at the magnetic surfaces.

UNIT 4. ELECTROMECHANICAL ENERGY CONVERSION 9

Faradays law of electromagnetic induction-Inductance of solenoids, toroids, transmission lines and cables-Mutual inductance of series and parallel circuits-Energy stored in magnetic fields--Magnetic circuits -Examples.

UNIT 5. MAXWELL'S EQUATION AND ELECTROMAGNETIC WAVES 9

Modified Ampere circuital law -Maxwell equation in point and integral forms-Wave equation-wave equations in Phasor form-Electromagnetic wave in

perfect dielectric-Electromagnetic wave in good conductor-skin depth-Reflection of uniform plane waves-Poynting's theorem

L=45 T=15 Total =60

TEXT BOOK

1. K.A.Gangadhar, Field theory,Khanna Publishers, New Delhi,1980.

REFERENCES

1. William Hayt, Engineering Electromagnetics, McGraw Hill, New York,1989.
2. John D.Kraus, Electromagnetics, McGraw Hill.

EE 204 FLUID MECHANICS AND THERMAL LAB

L	T	P	C
0	0	3	1

OBJECTIVES:

To experimentally verify the performance and characteristics of DC Motors, DC Generators and Transformers

To study the operation of DC motor starters, different connections of Transformers.

List of Experiments

1. Open Circuit and load characteristics of a separately excited DC Generator.
2. Open Circuit and load characteristics of DC Shunt generator
3. Load characteristics of DC compound generator.
4. Load test on DC motor.
5. Load test on DC series motor
6. Speed control of DC Shunt motor.
7. Swinburne's Test
8. Study of DC motor starters
9. Load test on single phase transformer.
10. Open circuit and short circuit test on single phase Transformer.
11. Separation of no load losses in a single phase transformer.
12. Sumpner's Test
13. Three Phase connection.
14. Scott connection

Total :45

ME 283	FLUID MECHANICS AND MACHINERY LAB	L	T	P	C
		0	0	3	1

Fluid Mechanic and Machinery Lab

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Performance Study on Centrifugal Pump
4. Performance Study on Jet Pump
5. Performance Study on Pelton Wheel
6. Performance Study on Reciprocating Pump
7. Performance Study on Francis Turbine.

Thermodynamics Lab.

1. Valve Timing and Port timing diagram
2. Performance test on 4 stroke petrol / diesel engine
3. Heat balance test on 4 stroke diesel engine
4. Performance test on air compressor
5. Performance test on Vapour Compression Refrigeration System
6. Determination of convective heat transfer coefficient in (a) natural convection and (b) forced convection

Total :45

EN 201 COMMUNICATION SKILLS LABORATORY-II

L	T	P	C
0	0	3	1

OBJECTIVES:

1. To prepare students for placement interviews.
2. To acquire Business English qualification at Vantage level
3. To help them develop interpersonal and social skills.
4. To develop their writing skills in order to write reports.
5. To improve their speaking skills so as to converse in their professional and business situations.

Unit I: Discussion Skills: 9

Negotiations - Types of Negotiations - Selling and Buying Products, Negotiating face to face and on the Phone - Bargaining and Making Concessions-. Group Discussions.

Unit II: Presentation Skills 9

Tips for effective Presentation, Different types of Presentation - Sales Presentation, Project Presentation, etc., Presentation practice.

Unit III: Business Communication skills 9

Writing Minutes - Note making - Letter Writing - Applying for Jobs, CV Writing, To invite a candidate for an interview, Job promotion letters.

Unit IV: Interview Skills 9

Preparing for Interviews - Etiquette, Body Language, Dress Code etc., Mock Interviews

Unit V: Managerial and Social Skills 9

Organizing, Conducting and Participating in Meetings - Interacting with people - Time Management - Writing Business Reports - Language and Style, Reports on Conferences, Meetings.

Total :45

REFERENCES

1. BEC Vantage, Cambridge University Press. Edition 2005.
2. Bill Mascull. 'Business Vocabulary in Use. Cambridge University Press. Cambridge, 2002.
3. Bill Mascull. 'Business Vocabulary in Use' Advanced. Cambridge University Press. Cambridge, 2004.
4. Comfort, Jeremy. Et.al. 'Speaking Effectively: Developing Speaking Skills for Business English.' Cambridge University Press. Cambridge, 1984.
5. Gerson, Sharon, Steve M.Gerson. ' Technical Writing: Process and Product' Pearson Education , New Delhi. 2004.
6. Leo Jones. 'New International Business English' Students book. Cambridge University Press. 2003.
7. Leo Jones. ' New International Business English' Teachers' book . Cambridge University Press. Cambridge. 2003.
8. Richards, Jack.C. 'New Interchange: English for International Communication.' Foundation Books Pvt. Ltd., New Delhi, 2006
9. Riordan, Pauley. 'Report Writing Today' AITBS Publisher, New Delhi. 2000.
10. Rutherford , Andrea. J. ' Basic Communication Skills For Technology' Pearson Education Asia. 2002.
11. Simon Sweeney. 'Communicating in Business' Students Book. Cambridge University Press. Cambridge , 2003.
12. Simon Sweeney. 'Communicating in Business' Teacher's Book. Cambridge University Press. Cambridge, 2004.

SEMESTER IV

MA 205	NUMERICAL METHODS	L	T	P	C
		3	1	0	4

UNIT 1 SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Linear interpolation methods (method of false position) - Newton's method - Statement of Fixed Point Theorem - Fixed point iteration: x=g(x) method - Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method - Eigenvalue of a matrix by power method.

UNIT 2 INTERPOLATION AND APPROXIMATION 9

Lagrangian Polynomials - Divided differences - Interpolating with a cubic spline - Newton's forward and backward difference formulas.- Relations between operators (E, ∇, μ, Δ)

UNIT 3 NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Derivatives from difference tables - Divided differences and finite differences -Numerical integration by trapezoidal, Simpson's 1/3 and 3/8 rules - Romberg's method - Two and Three point Gaussian quadrature formulas - Double integrals using trapezoidal and Simpson's rules.

UNIT 4 INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method - Euler and modified Euler methods - Fourth order Runge - Kutta method for solving first and second order equations - Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT 5 BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIALEQUATIONS 9

Finite difference solution of second order ordinary differential equation - Finite difference solution of one dimensional heat equation by explicit and implicit methods - One dimensional wave equation and two dimensional Laplace and Poisson equations.

L=45 T=15 Total =60

REFERENCES

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
3. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
4. M.K.Venkataraman "Numerical Methods" The National Publishing Co. Chennai.
5. S.S.Sastry "Introductory Methods of Numerical Analysis", PHI of India (p) Ltd. New Delhi.

CS 281 COMPUTER ARCHITECTURE L T P C
3 0 0 3

OBJECTIVE:

Objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. This course mainly focuses on the computer hardware and system software. It aims to describe the following aspects-

- Building blocks of the computer
- Computer Design

UNIT 1 INTRODUCTION 5

Generation of computer systems - basics of computer architecture - stored program organization - instruction format types - addressing modes - stack organization.

UNIT 2 ARITHMETIC AND LOGIC UNIT 10

Fixed-point arithmetic operations - addition, subtraction, multiplication and division - floating point arithmetic operations - design of ALU - bits slice processors.

UNIT 3 CONTROL UNIT 10

Instruction sequencing and interpretation - hardwired control - micro-programmed control - nano-programming.

UNIT 4 MEMORY AND I/O UNITS 10

Memory hierarchy - organization and design - interleave memories - memory management and virtual memory - Cache and associated memories. Basic concepts of input/output program I/O - Interrupts and DMA - I/O processors.

UNIT 5 ADVANCED COMPUTER ARCHITECTURE 10

RISC concepts - RISC Vs CISC architecture - recent developments - an example RISC architecture - parallel processor - pipe-line processor - multi-processors - vector and array processors - data flow computers.

L=45 T=0 Total =45

TEXT BOOKS

1. Morris Mano, M., 'Computer System Architecture', Prentice Hall of India, 1994.

2. John Hayes P., 'Computer Architecture and Organization' McGraw Hill, 1989.

EE 206 ELECTRICAL MACHINES - II L T P C
3 0 0 3

To impart knowledge on

- Construction and performance of salient and non - salient type synchronous Generators.
- Principle of operation and performance of synchronous motors.
- Construction, principle of operation and performance of induction machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details - Types of rotors - emf equation - Synchronous reactance - Armature reaction - Voltage regulation: EMF, MMF, ZPF and A.S.A methods - synchronization and parallel operation -Synchronizing torque- Change of excitation and mechanical input- Two reaction theory - Determination of direct and quadrature axis synchronous reactance using slip test - Operating characteristics - Capability curves.

UNIT II SYNCHRONOUS MOTOR 8

Principle of operation - Torque equation - Operation of infinite bus bar - V-Curves - Power input and power developed equations - Starting methods - Current loci for constant power input, constant excitation and constant power developed.

UNIT III THREE PHASE INDUCTION MOTOR 12

Constructional details - Types of rotors - Principle of operation - Slip - Equivalent circuit - Slip-torque characteristics - Condition for maximum torque - Losses and efficiency - Load test - No load and blocked rotor tests - Circle diagram - Separation of no load losses - Double cage rotors - Induction generator - Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 7

Need for starters - Types of starters - Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters - Speed control: - Change of voltage, torque, number of poles and slip - Cascaded connection - Slip power recovery scheme.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES **9**

Constructional details of single phase induction motor - Double revolving field theory and operation - Equivalent circuit - No load and blocked rotor test - Performance analysis - Starting methods of single-phase induction motors - Special machines :- Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

L = 45 T = 0 Total = 45

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. Sheila.C.Haran, 'Synchronous, Induction and Special Machines', SciTech Publications, 2001.

EE 207 TRANSMISSION AND DISTRIBUTION L T P C
3 1 0 4

OBJECTIVES:

- To develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based for determining voltage regulation and efficiency.
- To analyze the voltage distribution in insulator strings /underground cables
- To understand the operation of the different distribution schemes.

UNIT I INTRODUCTION 9

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system. FACTS (qualitative treatment only): TCSC, SVC, STATCOM, UPFC.

UNIT II TRANSMISSION LINE PARAMETERS 9

Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; application of self and mutual GMD; skin and proximity effects; interference with neighboring communication circuits. Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines: Short , medium and long lines; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV INSULATORS AND CABLES 9

Insulators: Types, voltage distribution in insulator string, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V SUBSTATION, GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 9

Types of substations; bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker, double bus with single breaker, main and transfer bus, ring bus, breaker-and-a-half with two main buses, double bus-bar with bypass isolators.

Resistance of grounding systems: Earth electrodes, Earth Resistance with driven rods, resistance of ground wires, grounding grids; design principles of substation grounding system; neutral grounding.

Radial and ring-main distributors; interconnectors; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. Kothari I, D P, "Power System Engineering", Tata Mcgraw Hill, 2nd Edition,2008.
2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCES

1. Luces M.Fualkenberry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

GE 201 ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **9**

Definition, scope and importance, Need for public awareness. Natural resources and associated problems - Uses, over exploitation and environmental impacts of (a) Forest resources, (b) Water resources, (c) Mineral resources, (d) Food resources, (e) Land resources, (f) Energy resources - Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS **9**

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a) Terrestrial ecosystems (Forest, Grassland, Desert), (b) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT III BIODIVERSITY AND HUMAN POPULATION **9**

Introduction - Definition, genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-sports of biodiversity; Threats to biodiversity - habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.Population growth, variation among nations; Population explosion; Family Welfare Programme

UNIT IV ENVIRONMENTAL POLLUTION AND ITS CONTROL **9**

Definition, Cause, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes; Role of an individual in prevention of pollution; Disaster management: floods, earthquake, cyclone and landslides.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns; Environmental ethics: Issues and possible solutions; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Wasteland reclamation; Consumerism and waste products; Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

Environment and human health; Human Rights; Value Education; HIV/AIDS; Women and Child Welfare; Role of Information Technology in Environment and human health.

L = 45 T = 0 Total = 45

TEXT BOOKS

1. Erach Bharucha, Text Book for Environmental Studies - Environmental Studies For Undergraduate Courses, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research, Pune, 2004.
2. Purohit S.S., Shammi Q.J., Agarwal A.K., A Text Book of Environmental Sciences, Student Edition of India, 2004.

REFERENCES

1. Clair N. Sawyer, Perry L. McCarthy and Gene F. Parkin, Chemistry for Environmental Engineering and Science, 5th Edition, Tata McGraw-Hill Education Pvt. Ltd, India, 2011.
2. Surinder Deswal and Anupama Deswal, A Basic Course in Environmental Studies, Dhanpat Rai & Co. (P) Ltd., India, 2005.

CS 284 OBJECT ORIENTED PROGRAMMING L T P C
3 0 2 4

OBJECTIVES:

- In this course the fundamentals of Object oriented programming language (OOP) will be studied. The topics included are control structure, functions, arrays, abstraction and encapsulation, classes and abstract classes and objects, inheritance, polymorphism, constructors, access control and overloading, Generics, Collections, and API. OOP is the most widely employed technique for developing robust, reusable software. Students will learn the concept of algorithm design and implementation.

UNIT 1. OBJECT ORIENTED PROGRAMMING PARADIGM 2

Introduction - reusability - security - object oriented programming fundamental - abstraction - encapsulation - derivation - object oriented languages and packages.

UNIT 2. CLASSES AND OBJECTS 7

Introduction to C++ - procedural oriented approach to C++ - data types - control structures - problem solving - standard input output streams - C++ enhancement - function proto types - default reference variables - constant - classes - construction - distracts - constraint objects - member objects - member functions.

UNIT 3. ADVANCED FEATURES 7

Dynamic memory allocation pointers - new and delete operators - classes with pointers - copy constructor - static members - friend classes - friend functions - operator over loading.

UNIT 4. POLYMORPHISM AND INHERITANCE 7

Function overloading - connection classes - derived classes - class conversion - protected members - virtual function - dynamic binding - abstract classes - multiple inheritances - templates - error handling.

UNIT 5. CASE STUDIES 7

Over view of typical object oriented systems - case studies - application to electrical engineering.

L = 30, P = 30, TOTAL = 60

TEXT BOOKS

1. D.Ravi Chandran, Programming with C++, Tata Mc Graw Hill India, 2003.
2. E.Bala Gurusamy,"Object Oriented Programming with C++",4TH Edition, Tata McGraw Hill,2008.
3. Robert Lafore,"Object Oriented Programming in C++", Sams publishing, 2002.

REFERENCES

1. Bertrand Meyer, 'Object Software Construction', Prentice Hall, 1988.
2. Baarkakati. N., 'Object Oriented Programming in C++', Prentice Hall of India, 1997.
3. Stanley B. Lipmann , 'C++ Primer' , Addition Wesley , 1998.
4. K.R.Dittrichetal, 'On Object Oriented Database System', Springer Verlag, 1991.

EE 207 ELECTRICAL MACHINES LABORATORY - II

L	T	P	C
0	0	3	1

OBJECTIVES:

To impart knowledge on

- Performance of salient and non - salient type synchronous Generators.
- Performance curves of synchronous and induction motors.

LIST OF EXPERIMENTS:

1. Regulation of three phase alternator by EMF and MMF methods
2. Regulation of three phase alternator by ZPF method.
3. Regulation of three phase salient pole alternator by slip test
4. Measurements of negative sequence and zero sequence impedance of alternators.
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor test on three-phase induction motor.
8. Separation of No-load losses of three-phase induction motor.
9. Load test on single-phase induction motor
10. No load and blocked rotor test on single-phase induction motor.
11. Computer Controlled DC motor Drive.
12. Computer Controlled AC motor Drive.

ME 283 FLUID MECHANICS AND MACHINERY LABORATORY

L	T	P	C
0	0	3	1

Fluid Mechanics and Machinery Lab:

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Performance Study on Centrifugal Pump
4. Performance Study on Jet Pump
5. Performance Study on Pelton Wheel
6. Performance Study on Reciprocating Pump
7. Performance Study on Francis Turbine.

Thermodynamics Lab.

1. Valve Timing and Port timing diagram
2. Performance test on 4 stroke petrol / diesel engine
3. Heat balance test on 4 stroke diesel engine
4. Performance test on air compressor
5. Performance test on Vapour Compression Refrigeration System
6. Determination of convective heat transfer coefficient in (a) natural convection and (b) forced convection

EC 283	ELECTRONICS DEVICES AND CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1

OBJECTIVES:

- To obtain the characteristics of amplifier circuits
- To study the working of different types of oscillators
- To study the working of voltage regulators.

LIST OF EXPERIMENTS:

1. Characteristics of PN junction diode.
2. Characteristics of Zener diode.
3.. FET amplifier.
4. Design and Fabrication of Transistor Amplifier
5. Phase shift and Wein bridge Oscillator
6. Hartley and Colpit oscillator
7. Design and Fabrication of Voltage regulators
8. Fabrication and Design of Control circuits using Timers.
9. Design and Fabrication of Different waveform generators.

TP 201 CONFIDENCE BUILDING & BEHAVIOURAL SKILLS L T P C
(Common for all branches) 0 0 2 1

Note : This course will be offered by Training and Placement faculty supplemented by outsiders.

1. At the end of this training program the participant will be able to, 15

- Define self confidence
- Comprehend the importance of having self confidence
- Discuss ways to build up self confidence
- Recognize the importance of the tips and warnings

2. Improving of, 15

- Behavioural Patterns and Basic Etiquette
- Value System
- Inter Personal Skills
- Corporate Culture
- Self Awareness
- Managing Self and Personality Styles

TOTAL: 30

SEMESTER V

EC 381 DIGITAL SYSTEMS and INTEGRATED CIRCUITS

L	T	P	C
3	0	0	3

Unit 1 BOOLEAN ALGEBRA AND COMBINATIONAL LOGIC DESIGN 9

Arithmetic with base other than ten - Alphanumeric codes - AND, OR and NOT operations -De-Morgan's law in minimization of Boolean functions using basic laws - sum of products, product of sum forms - Minterms and Maxterms - minimization using k-map method and Quine-McClusky method - hazard free circuit diagram.

Unit 2. LOGIC FAMILIES AND DIGITAL ICs 9

RTL, DTL, TTL, ECL and MOS families and their characteristics - internal circuits of basic gates AND, OR, NOT and XOR using Bipolar, MOS and CMOS families - multiplexer and demultiplexer - encoder and decoder - half-adder and full-adder - subtractor and magnitude comparators - SR, JK, D and T Flip-flop - Analysis of synchronous and asynchronous sequential circuits.

Unit 3. DESIGN OF DIGITAL SYSTEMS 9

Examples of combinational logic circuit design - sequential logic circuit design -State minimization - design of counters using flip-flops - system design using multiplexer and demultiplexer - encoder - decoder - memory based design - design using PAL and PLA.

Unit 4. LINEAR INTEGRATED CIRCUITS 9

Introduction to Linear IC - operational amps - characteristics -Band width, slew rate ,noise and frequency compensation-applications of op-amps - arithmetic circuits-summer and subtractor-Multiplier and Divider circuits-Differentiator ,Integrator-Instrumentation amplifier, AC amplifier rectifier in op-amp circuits using diodes - I, II order filters, waveform generators using op-amps

Unit 5. SINGNAL GENERATORS and ICS 9

Square, triangular and sine wave generations. Basic functional internal block diagram, characteristics and applications of following IC's: 555, 565, LM723 voltage regulator and current regulators-PRBS generators - frequency counters - NMOS, CMOS, Bipolar IC technology - IC fabrication - NMOS, CMOS, Bipolar IC technology - IC fabrication - assembly technique and package of VLSI devices

L = 45 T = 0 Total = 45

TEXT BOOK

1. Malvino and Leach, 'Digital Principles and Applications', McGraw Hill, 1986.
2. Ramakant A. Gayakwad, 'Op-Amps and Linear Integrated Circuits', Prentice Hall of India, 3rd Edition, 1997.
3. Roy Choudhury and Shail Jain, 'Linear Integrated Circuits', 1995.

REFERENCES

1. Taub and Schilling, 'Digital Integrated Circuits', McGraw Hill
2. Millman, J. and Halkias, C.C., 'Integrated Electronics: Analog and Digital Cicuits and Systems', McGraw Hill, Kogakusha Ltd. Tokyo, 1972.
3. Fletcher, W.I., 'An Engineering Approach to Digital Design', Prentice Hall of India, 1996.
4. S.M.Sze, 'VLSI Technology', 2nd Edition, Tata McGraw Hill, 1996.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog and Integrated Circuits', 2nd Edition, McGraw Hill, 1997.
6. R.A.Gayakwad, 'Operational amplifiers and Linear Integrated Circuits', Prentice Hall Ltd., 1995.
7. Franco S., 'Design with Operational and integrated Circuits', Tata McGraw Hill, 1998.

EE 301 DESIGN OF ELECTRICAL APPARATUS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.
- To design stator and rotor of induction machines.
- To design stator and rotor of synchronous machines and study their thermal behaviour.

Unit 1. INTRODUCTION **9**

Basic concept of design - standard specifications - classification of materials - electric and magnetic circuits - leakage reactance calculation - thermal rating of electrical apparatus - performance prediction from rating.

Unit 2. DC MACHINES **9**

DC Machines - constructional details - output equation - main dimensions - choice of number of poles - armature and field dimension - design of commutator and brushes - performance prediction.

Unit 3. TRANSFORMERS **9**

Constructional details - output rating - output equation - design of core windings - single and three-phase transformers - determination of no-load current and equivalent circuit parameters - design of tank and cooling tubes for distribution transformers - performance calculation.

Unit 4. INDUCTION MOTORS **9**

Constructional details - output equation - main dimensions - design of stator - design of squirrel cage and slip ring rotor - determination of no-load current and equivalent circuit parameters - performance prediction using circle diagram.

Unit 5. SYNCHRONOUS MACHINE **9**

Computer in design, flow-chart, magnetic field calculations using finite difference and finite element methods. Determination of equipotential lines.

L=45
T=15 Total = 60

TEXT BOOK

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1987.

2. Sen, P.K., 'Principles of Electrical Machine Designs with Computer Programs', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

EE 302 POWER ELECTRONICS L T P C
3 0 0 3

OBJECTIVES:

- To get an overview of different types of power semi-conductor devices and their Switching characteristics.
- To understand the operation, characteristics and performance parameters of Controlled rectifiers.
- To study the operation, switching techniques and basic topologies of DC-DC Switching regulators.

Unit 1. POWER SEMICONDUCTOR DEVICES 9

Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC, BJT, IGBT, MOSFET, - Turn-on and turn-off characteristics, switching losses, Commutation circuits for SCR.

Unit 2. PHASE CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters - Effect of source inductance - performance Parameters - Reactive power control of converters - Dual converters - Battery charger

Unit 3. DC TO DC CHOPPERS 9

Step-down and step-up chopper - Time ratio control and current limit control - Buck, boost, buck-boost converter, concept of Resonant switching - SMPS.

Unit 4. INVERTERS 9

Single phase and three phase (both 1200 mode and 1800 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM - Introduction to space vector modulations - Voltage and harmonic control - Series resonant inverter -current source inverter.

Unit 5. AC VOLTAGE CONTROLLERS 9

Single phase AC voltage controllers - Multistage sequence control - single and three phase cycloconverters -Introduction to Integral cycle control, Power factor control and Matrix converters.

L = 45 T=0
Total = 45

TEXT BOOK

1. Rashid, M.H., 'Power Electronics - Circuits, Devices and Applications', Prentice Hall International, 1995.

REFERENCES

1. Dubey, G.K., Doradadla, S.R., Joshi, A. and Sinha, R., 'Thyristorised Power Controllers',Wiley Eastern Limited, 1986.

2. Lander, W., 'Power Electronics', McGraw Hill and Company, Third Edition, 1993.

EE 303 CONTROL SYSTEMS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To understand the methods of representation of systems and to derive their Transfer function models.
- To provide adequate knowledge in the time response of systems and

steady State error analysis.

- To accord basic knowledge in obtaining the open loop and closed-loop Frequency responses of Control systems.

Unit 1. BASIC CONCEPTS AND SYSTEM REPRESENTATION 9

Basic elements in control systems - Open and closed loop systems - Electrical analogy of mechanical and thermal systems - Transfer function - Synchros - AC and DC servomotors - Block diagram reduction techniques - Signal flow graphs.

Unit 2. TIME RESPONSE ANALYSIS AND DESIGN 9

Time response - Time domain specifications - Types of test input - I and II order system

Response - Error coefficients - Generalized error series - Steady state error - P, PI, PID

modes of feedback control.

Unit 3. FREQUENCY RESPONSE ANALYSIS AND DESIGN 9

Performance specifications-correlation to time domain specifications-bode plots and polar plots -gain and phase margin -constant M and circles and Nichols chart -all pass and non-minimum phase systems.

Unit 4. STABILITY 9

Characteristics equation - Location of roots in s plane for stability - Routh Hurwitz criterion

- Root locus construction - Effect of pole, zero addition - Gain margin and phase margin -

Nyquist stability criterion.

Unit 5. COMPENSATOR DESIGN 9

Performance criteria - Lag, lead and lag-lead networks - Compensator design using bode plots.

L=45 T=15 Total =60

TEXTBOOK

1. K. Ogata, 'Modern Control Engineering', 4th edition, Pearson Education,

New Delhi, 2003

2. I.J. Nagrath & M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.

REFERENCES

1. C.J.Chesmond.'Basic Control System Technology', Viva low priced student edition, 1998.

2. I.J.Nagarath and M.Gopal,'Control System Engineering, 'Wiley Eastern ltd., Reprint 1995.

3. R.C.Dorf and R.H.Bishop, 'Modern Control Systems', Addison-Wesley, 1995 (MATLAB Reference)

EE 304 POWER SYSTEM ANALYSIS L T P C
3 1 0 4

OBJECTIVES:

To impart knowledge and computational skills required to model and analyze large-scale power systems under normal and abnormal operating conditions using efficient numerical techniques suitable for computer application which are required for planning and operation of power system.

Unit 1. INTRODUCTION **9**

Need for system analysis in planning and operation of power system - distinction between steady state and transient state - per phase analysis of symmetrical three-phase system.- per unit representation-problems.

Unit 2. NETWORK MODELLING **9**

Primitive network and its matrices - bus incidence matrix - bus impedance and bus admittance matrix formation - equivalent circuit of transformers with off-nominal tap ratio. Modeling of generator, load, transmission line for power flow and stability studies.

Unit 3. SHORT CIRCUIT ANALYSIS **9**

Need for short circuit study. Symmetrical short circuit analysis - symmetrical component transformation - sequence impedances - Z-bus in phase frame and in sequence frame fault matrices - unsymmetrical fault analysis.

Unit 4. POWER FLOW ANALYSIS **9**

Problem definition - bus classification - derivation of power flow equation - solution by Gauss-siedel and Newton-Raphson methods -FDPF method-computation of slack bus power, transmission loss and line flow.

Unit 5. STABILITY ANALYSIS **9**

Steady state and Transient stability-stability limits-swing equation for single machine infinite bus system-Equal area criterion-Solution of swing equation by modified Euler and Runge-Kutta methods.

L = 45 T = 15 Total =60

TEXT BOOK

1. John J. Grainger and Stevenson Jr. W.D., 'Power system analysis', McGraw Hill International Edition, 1994.

REFERENCES

1. Stagg, G.W. and El-Abiad, A.H., 'Computer methods in Power System Analysis', McGraw Hill International Book Company.

2. Nagrath, I.J. and Kothari, D.P., 'Modern Power System Analysis', Tata McGraw Hill, 1990.

EC 391 COMMUNICATION ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES

- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission

- To introduce various media for digital communication

Unit 1. RADIO COMMUNICATION SYSTEMS **15**

Frequency spectrum - Principle of AM and FM and FM transmitters and receivers-introduction to microwave communication systems-principle of satellite communication

Unit 2. PULSE COMMUNICATION SYSTEMS **5**

PAM, PPM, PDM, PCM- delta modulation -differential PCM -merit and demerits -comparison of pulse modulation schemes.

Unit 3. DATA TRANSMISSION **10**

Base band signal receiver -error probability-optimum and matched filter techniques coherent reception -digital modulation systems -FS,PSK-comparison of data transmission systems.

Unit 4. TRANSMISSION MEDIUM **10**

Characteristics of cables -optical fibers -effects of EM radiation -bandwidth and noise restrictions -statistical measurements of random noise -concept of multiplexing -FDM and TDM.

Unit 5. TELEVISION **5**

Scanning methods -B/W and colour systems - camera and picture tubes - synchronization-transmitters and receivers.

L=45 T=0 Total =45

TEXT BOOK

1. Kennedy,G.,'Electronic Communication Systems',McGraw Hill ,4th edition,1987.
2. Taub and Schilling, Principles of Communication Systems',Second Edition,Mc Graw Hill 1987.

REFERENCES

1 . Roddy and Coolen ,'Electronic Communication ?4 th Edition,Prentice Hall of India,1999.
2. Bruce Carlson ,A. Communication Systems 3 rd Edition,TMH,1986.

EE 305 CONTROL SYSTEMS LABORATORY

L	T	P	C
0	0	3	1

1. Transfer function of separately excited DC Generator.
2. Transfer function of Armature controlled DC Motor.
3. Transfer function of AC Servomotor.

4. Compensating networks.
5. Study of synchro's.
6. DC stepper motor.
7. DC Position control system.
8. Digital control of first order plant (P, PI and PID).
9. Digital control of second orders liquid level system (state variable feedback).
10. Study of transducers.
11. Study of Programmable Logic Controllers.

P = 45
Total = 45

EE 306 POWER ELECTRONICS LABORATORY

L	T	P	C
0	0	3	1

1 Designing and fabrication of cyclo converter.
2 Designing and fabrication of DC -DC converter
3 Fabrication of Triac Phase controllers.

5 Designing and fabrication of firing circuits for Thyristors.

6 Designing and fabrication of gate driver circuits for MOSFET s and IGBTs.

7 Study of interfacing PIC microcontrollers with PC.

8 Gate pulse generation using PIC Controllers.

9 Fabrication of SCR based converters (open loop).

10 Fabrication of converter with closed loop using PIC microcontroller based PI and PID controllers.

11 Fabrication of Inverters using MOSFET and IGBT (open loop).

12 Fabrication of Inverters with closed loop using PIC microcontroller based PI and PID controllers.

P = 45 Total = 45

TP 301	**CAREER BUILDING & PEOPLE SKILLS (Common for all branches)**	**L T P C** **0 0 2 1**

Note : This course will be offered by Training and Placement faculty supplemented by outsiders. The course content will include,

- Creation of awareness of the top companies / different verticals / courses for

improving skill set matrix.

- Industry expectations to enable them to prepare for their career.
- Group discussions: Do's and Don'ts - handling of Group discussions - What evaluators look for.
- Development of positive frame of mind - avoiding inhibitions - Creation of self awareness - Overcoming of inferiority / superiority complex.
- Interview - awareness of facing questions - Do's and Don'ts of personal interview.
- Selection of appropriate field vis-à-vis personality / interest.
- Preparation of Curriculum Vitae - Objectives, profiles vis-a-vis companies.
- Enabling students prepare for different procedures / levels to enter into any company - books / websites to help for further preparation.
- Technical interview - how to prepare to face it.
- Entrepreneurship development - preparation for tests prior to the interview - Qualities and pre-requisites for launching a firm.
- Interpersonal relationships - with colleagues - clients - understanding one's own behavior - perception by others.
- How to work with persons whose background, culture, language / workstyle different from one's.

SEMESTER VI

		L	T	P	C
EE 307	**BIO MEDICAL ENGINEERING**	**3**	**0**	**0**	**3**

OBJECTIVES:

- To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Biomedical applications of different transducers used.
- To introduce the student to the various sensing and measurement devices of Electrical origin. To provide awareness of electrical safety of medical equipments

Unit 1. INTRODUCTION 9

Cell structure - resting and action potential - heart, lungs, kidney, Heart-lung machine, Circulatory System, Respiratory System, Nervous System, Urinary System.

Unit 2. TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATION 9

Basic transducer principles - source of bioelectric potentials - resistive, inductive, capacitive, fiber-optic, photoelectric and chemical transducers - their description and feature applicable for biomedical instrumentation. Bio-potential electrodes.

Unit 3. SIGNAL CONDITIONING, RECORDING AND DISPLAY 9

Input isolation, DC amplifier, power amplifier, and differential amplifier - feedback, op Amp-electrometer amplifier, carrier Amplifier - instrument power supply. Oscillographic - galvanometric - X-Y, magnetic recorder, storage oscilloscopes-electron microscope-PMMC writing systems.

Unit 4. CARDIAC MEASUREMENTS 10

Electrocardiograph measurements - blood pressure measurement: by ultrasonic method-plethymosonography - blood flow measurement by electromagnetic flow meter-cardiac output measurement by dilution method - phonocardiography - vector cardiography- cardiac pacemaker - DC - defibrillator, patient safety - electrical shock hazards. artificial ventilator - Anesthetic machine - Basic ideas of CT scanner - MRT and ultrasonic scanner-laser equipment and application. Dialysis

Unit 5. COMPUTERS IN BIO-MEDICAL INSTRUMENTATION 8

Introduction - computers in medicine - basics of signal conversion and digital filtering - data reduction technique - time and frequency domain technique - ECG Analysis. - bio-telemetry, computer tomography.

L=45 T=0
Total = 60

TEXT BOOKS

1. Khandpur, R.S., 'Handbook of Biomedical Instrumentation', TMH, 1989.

2. Arumugam M., 'Bio Medical Instrumentation', Anuradha agencies Pub., 2002.

REFERENCES

1. Geddes L.A., and Baker, L.E., 'Principles of Applied Bio-medical Instrumentation', 3rd Edition, John Wiley and Sons, 1995.

2. Cromwell, Weibell and Pfeiffer, 'Biomedical Instrumentation and Measurements', 2nd Edition, Prentice Hall of India, 1999.

3. Tompkins W.J., Biomedical Digital Signal Processing, Prentice Hall of India, 1998.

EE 308 MEASUREMENTS AND INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To make the student have a clear knowledge of the basic laws governing

the operation of the instruments, relevant circuits and their working.

- Introduction to general instrument system, error, calibration etc.

Unit 1. INTRODUCTION 6

Functional elements of an instrument - static and dynamic characteristics - errors in measurement - statistical evaluation of measurement data - standard and calibration.

Unit 2. TRANSDUCERS 10

Classification of transducers - selection of transducer - resistive, capacitive and inductive transducer - piezo electric transducer - optical and digital transducers. PH electro transducers for measurement of displacement, temperature, level, pressure, velocity and acceleration.

Unit 3. SIGNAL CONDITIONING CIRCUITS 9

Bridge circuits - differential and Instrumentation amplifier - filter circuits - V/f and f/V converters - P/I and I/P converters - S/H Circuit, A/D and D/A converters - multiplexing and demultiplexing - data acquisition systems -ground techniques.

Unit 4. STORAGE AND DISPLAY DEVICES 8

Magnetic disc and tape recorders - digital plotters and printers - CRT displays - digital CRO - LED, LCD and matrix displays.

Unit 5. ELECTRICAL AND ELECTRONICS INSRUMENTS 12

Principle and types of analog and digital ammeters and voltmeters - single and three phase Wattmeter's and Energy meter - magnetic measurements - instrument transformers - instruments for measurement of torque, speed, frequency, phase, viscosity and moisture.

L = 45 T=0 Total = 45

TEXT BOOK

1. Doebelin, E.O., 'Measurement Systems - Application and Design', McGraw Hill Publishing Company, 1990.

REFERENCES

1. Stout, M.B., 'Basic Electrical Measurement ', Prentice Hall of India, 1986.
2. Murthy, D.V.S., 'Transducer and Instrumentation', Prentice Hall of India Pvt. Ltd., 1995.
3. Coombs, C.F., 'Electronic Instrument Handbook', McGraw Hill, 1995.
4. Morris, A.S., 'Principle of Measurement and Instrumentation', Prentice Hall of India, 1999.

EE 309 POWER GENERATION SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study about the power generation through thermal, hydel and nuclear

power plants

- To study about the Renewable sources of energy for power generation.

Unit 1 Thermal and Hydro Generating Stations 9

Generating stations - steam power station - schematic arrangement of steam power station - choice of site for steam power station - Efficiency of steam power station - Equipment of steam power station -hydroelectric power station - schematic arrangement of hydro electric power station - choice of site for hydro electric power station - Constituents of Hydroelectric plant.

Unit 2 Diesel and Nuclear Generating Stations 9

Diesel power station - Schematic arrangement of Nuclear power station - Selection of site for nuclear power station - gas turbine power plant - schematic arrangement of gas turbine power plant- comparison of the various power plants.

Unit 3 Variable load on power station and economics of power generation 9

Load curve - important terms and factors load factor - load duration curve - typical demand and diversity factor - load curve and selection of generating units - base load and peak load on power station - cost of electrical energy - Tariff - types of Tariff - Desirable Characteristics of Tariff.

Unit 4 New energy sources - solar energy 9

Solar Radiation- solar radiation outside the earth's atmosphere - solar radiation at the earth's surface - Instruments for measuring solar radiation and sunshine- Liquid flat plate collectors - collector efficiency factor - Effects of various parameters on performance Solar power plant --- solar energy storage - solar hydrogen energy cycle - solar air heater - solar pond - use of solar energy in India .

Unit 5 New energy sources - others 9

Principle of MHD generation - open and closed cycle MHD system - wind energy - wind mills - variation of power output in wind speed - selection of sites for wind turbine generating station - tidal energy - tidal barrage - tidal power schemes -- energy from bio-mass - availability of bio-mass- ocean thermal energy

L=45. T=0. Total=45

Text Books

1. S.P Sukhatme, solar energy - principle of thermal collection and storage, 2nd edition Tata mc-graw hill publishing company limited.
2. V.K Mehta, Rohit Mehta, principles of power system, S. chand company limited.
3. B.R Gupta, Generation of electrical energy, 2001 Eurasia publishing house private limited.

EE 310	PROTECTION AND SWITCHGEAR	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.

- To understand the characteristics and functions of relays and protection schemes.
- To understand the problems associated with circuit interruption by a circuit breaker.

UNIT I INTRODUCTION 9

Importance of protective schemes for electrical apparatus and power system. Qualitative review of faults and fault currents - relay terminology - definitions - and essential qualities of protection.

Protection against over voltages due to lightning and switching - arcing grounds - Peterson Coil - ground wires - surge absorber and diverters Power System earthing - neutral Earthing - basic ideas of insulation coordination.

UNIT II OPERATING PRINCIPLES AND RELAY CHARACTERISTICS 9

Electromagnetic relays - over current, directional and non-directional, distance, negative sequence, differential and under frequency relays - Introduction to static relays.

UNIT III APPARATUS PROTECTION 9

Main considerations in apparatus protection - transformer, generator and motor protection - protection of busbars. Transmission line protection - zones of protection. CTs and PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION 9

Physics of arc phenomena and arc interruption. DC and AC circuit breaking - restriking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current.

UNIT V CIRCUIT BREAKERS 9

Types of circuit breakers - air blast, air break, oil, SF6 and vacuum circuit breakers - comparative merits of different circuit breakers - testing of circuit breakers.

L = 45 T=0 Total = 45

TEXT BOOKS

1. Ravindranath,B and Chander,N, "Power System Protection and Switchgear", Wiley Eastern Ltd.
2. Chakrabarti.A.Soni.M.L.Gupta, P.V. "A Text book on Power System Engineering", Dhanpat Rai & Co. Pvt Ltd.

REFERENCES

1. C.L.WADHWA, "Electrical Power Systems", New Age International Pvt.Ltd Publishers,1995.
2. PatraS.P,Basu S.K, & Chowdury,S. "Power system Protection", Oxford and IBH Publishing Co. LTD.,1983.
3. Sunil S.Rao, "Switchgear and Protection",Khanna Publishers, New Delji,1986.

EC 383 MICROPROCESSORS AND MICRO CONTROLLER

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the Architecture of 8085,8086 and 8051.
- To study the addressing modes & instruction set of 8085 & 8051.

- To introduce the need & use of Interrupt structure 8085 & 8051.
- To develop skill in simple program writing for 8051 & 8085 and applications
- To introduce commonly used peripheral / interfacing ICs

UNIT I Introduction to 8085 PROCESSOR 9

Hardware Architecture pin outs - Signals - Memory interfacing - I/O ports and data Transfer concepts - Timing Diagram - Interrupt structure.-Introduction to 8086 processor.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction format and addressing modes - Assembly language format - Data transfer, data manipulation & control instructions - Programming: Loop structure with counting &Indexing - Look up table - Subroutine instructions - stack.

UNIT III PERIPHERAL INTERFACING 9

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279,Key board display controller and 8253 Timer/ Counter - Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV 8051 MICRO CONTROLLER 9

Functional block diagram - Instruction format and addressing modes - Timing Diagram Interrupt structure - Timer -I/O ports - Serial communication.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Data Transfer, Manipulation, Control & I/O instructions - Simple programming exercises, key board and display interface - Closed loop control of servo motor-stepper motor control - Washing Machine Control.

TOTAL: 45

TEXT BOOKS

1. "Microprocessor and Microcontrollers", Krishna Kant Eastern Company Edition, Prentice - Hall of India, New Delhi, 2007.
2. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi.

2. The 8088 & 8086 Microprocessors, Walter A Tribal & Avtar Singh, Pearson, 2007, Fourth Edition.

EC 384 DIGITAL SIGNAL PROCESSING

L	T	P	C
3	1	0	4

OBJECTIVES:

- To classify signals and systems with their mathematical representation.
- To analyze the discrete time systems.

- To study various transformation techniques & their computation.
- To study about digital filters and their design.

Unit 1. INTRODUCTION **9**

Characterization and classification of signals - examples signals - multichannel - multi-dimensional - continuous Vs discrete - analog Vs digital - concept of frequency- Concepts of signal processing typical applications - advantages of digital signal processing compared with analog processing.

Unit 2. DISCRETE TIME SYSTEMS **9**

Representations - classifications - time domain and frequency domain characterization - transfer function - Z-transform and applications.

Unit 3. FREQUENCY ANALYSIS OF SIGNALS **9**

Analysis of analog and discrete signals - using Fourier series- Fourier transform, Fourier transform of discrete sequence and discrete Fourier transform - properties of transforms - computation of discrete Fourier transforms - Radix 2. FFT algorithm.

Unit 4. DIGITAL PROCESSING OF CONTINUOUS SIGNALS **9**

Sampling of continuous signals - analog filter design - anti-aliasing filters - sample and hold circuits - reconstructing filters - analog to digital and digital to analog converters.

Unit 5. DIGITAL FILTERS **9**

Discretization of analog filters - direct discrete design - IIR and FIR structures - window functions - filter realization - introduction to digital signal architecture.

L = 45 P = 15 Total = 60

TEXT BOOK

1. S.K.Mitra, "Digital Signal Processing -A computer based approach", Tata Mc Graw Hill Edition,1998.

REFERENCES

1. Lonnie C.Ludeman, "Fundamentals of Digital Signal Processing", John Wiley

and Sons,1987.

2. J.G.Proakis and D.G.Manolakis, "Introduction to Digital Signal Processing", Macmillan Publishing Company, 1989.

3. R.G.Lyons, "Understanding Digital Signal Processing", Addisson Wesley, 1997

EE 311 MEASUREMENT AND INSTRUMENTATION LABORATORY

L	T	P	C
0	0	3	1

1. Study of temperature measuring transducer (RTD, Thermocouples and IC590).

2. Study of displacement and pressure transducers (LVDT, I/P and P/I).

3. Active filters.
4. Instrumentation amplifiers.
5. Linearization using microprocessors.
6. A/D and D/A converters.
7. Digital oscilloscopes.
8. Data acquisition system.
9. Torque and angle measurement.
10. Calibration of single phase energy meter.

P = 45 Total = 45

EC 385 IC AND MICROPROCESSOR LAB

L	T	P	C
0	0	3	1

I IC EXPERIMENTS

1. Study of RS, JK, D, T flip-flops, IC 555, IC741.

2. Code converters.
3. Shift registers; Counters.
4. Encoders, Multiplexers, Decoders and Demultiplexers.
5. Memory devices.
6. Application of Op-amp's.
7. Application Circuits of NE555

II MICROPROCESSOR EXPERIMENTS

1. Programming exercises involving loop with counter indexing
2. Multiplication and division of signed and unsigned numbers.
3. Interfacing LED, DIP and thumb wheel switches.
4. Interfacing of 8-bit D/A and A/D converters.
5. Design and implementation of temperature control loop.
6. Study of serial interface and interfacing VDU.

P = 45 Total = 45

TP 302	**PROBLEM SOLVING & THINKING SKILLS (Common for all branches)**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**1**

Note : This course will be offered by Training and Placement faculty supplemented by outsiders.

At the end of this training program the participant will be able to, 30

- Explain the concept of problem solving
- Outline the basic steps in problem solving
- List out the key elements
- Explain the use of tools and techniques in problem solving
- Discuss the personality types and problem solving techniques.
- By adapting different thinking styles in group and lean environment.
- Recognizing and removing barriers to thinking in challenging situations.
- Make better decision through critical thinking and creative problem solving.

TOTAL : 30

SEMESTER VII

		L	T	P	C
EE 401	**POWER SYSTEM CONTROL**	**3**	**1**	**0**	**3**

OBJECTIVES:

- To have an overview of power system operation and control.
- To model power-frequency dynamics and to design suitable Load frequency controller.
- To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.

Unit 1. INTRODUCTION 5

Need for voltage and frequency regulation in power system - system load characteristics - basic P-f and Q-v control loops - cross coupling between control loops - plant level and system level controls - recent trends of real-time control of power systems.

Unit 2. REAL POWER AND FREQUENCY CONTROL 15

Fundamentals of speed governing mechanisms and modeling - speed - load characteristics - regulation of two synchronous machines in parallel - control areas - LFC control of a single area - static and dynamic analysis of uncontrolled and controlled cases - multi-area systems - two area system modeling - static analysis -uncontrolled case - tie line with frequency bias control of two-area and multi-area system - steady state instabilities.

Unit 3. REACTIVE POWER - VOLTAGE CONTROL 8

Typical excitation system - modeling - static and dynamic analysis - stability compensation - effect of generator loading - static shunt capacitor/reactor VAR compensator, synchronous condenser, tap-changing transformer - static VAR system - modeling - system level voltage control.

Unit 4. COMPUTER CONTROL OF POWER SYSTEM 10

Energy control center functions - system hardware configuration SCADA system - functional aspects - security monitoring and control - system states and their transition - various controls for secure operation.

Unit 5. ECONOMIC DISPATCH CONTROL 7

Incremental cost curve - co-ordination equations with loss and without losses, solution by iteration method. (No derivation of loss coefficients). Base point and participation factors. Economic controller added to LFC control.

L = 45, T=15, TOTAL = 60

TEXT BOOKS

1. Olle I.Elgerd, 'Electric Energy and System Theory - An Introduction', Tata McGraw Hill Publishing Company, New Delhi. 1983.
2. Kirchmayer .L.K. 'Economic operation of power system', John wiley & Sons, 1953.

REFERENCES

1. Allen J.Wood, Bruce F.Wollenberg, 'Power Generation Operation and Control', John Wiley and Sons, 1984.
2. Mahalanabis, A.K., Kothari, D.P and Ahson, S.I., 'Computer Aided Power System Analysis and Control', Tata McGraw Hill Publishing Company, New Delhi, 1990.
3. Kundur, 'Power System Stability and Control', McGraw-Hill Pub. Co., 1994.

MS 081	ENGINEERING ECONOMICS AND MANAGEMENT CONCEPTS	L	T	P	C
		3	0	0	3

(Common for EEE, ECE, CSE, IT, ICE & Polymer branches)

UNIT I MICRO ECONOMICS FOR ENGINEERING 9

Basic economic concept - Importance of economics in engineering - Applications of economics in engineering - Demand and Supply: Laws, Influencing factors - Elasticity of demand - Demand forecasting - Types of costs - Break-even analysis: Meaning, Assumptions, Managerial uses, Limitations - Meaning of production function - Economies of scale. Pricing: Objectives - Pricing policies - Pricing methods

UNIT II MACROECONOMIC ENVIRONMENT 9

Types of market structures & competition: Meaning and Characteristics of Monopoly, Oligopoly, Monopsony, Perfect competition. Definition of National Income, GNP and GDP - Meaning and causes of Inflation and Deflation - Direct and Indirect taxes: Purpose, Merits and Demerits - Banking : Functions of Central bank and Commercial banks - Foreign exchange : International trade : Meaning, Need and Barriers - Meaning of Balance of Payments - Liberalisation, Privatization and Globalization : Concept and Advantages and Limitations.

UNIT III INTRODUCTION TO MANAGEMENT 9

Management: Definition, Nature and process of management - Functions and levels of management - Management as Science or Art - Management vs Administration - Approaches to management, Schools of thought and Contribution, Forms of business / Industrial ownership: Characteristics, Merits and demerits.

UNIT IV PLANNING, ORGANISING AND STAFFING 9

Planning: Types of plans - Planning Process - Management by Objectives - Management by Exception - Decision making process - Organizing: Purpose - Organizational Charts and Manual - Types of organization - Departmentation - Line and staff - Span of Control - Centralization vs. Decentralization - Delegation - Staffing: Recruitment - Selection - Placement - Training.

UNIT V DIRECTING AND CONTROLLING 9

Directing: Meaning and Objectives - Leadership: Definition, theories and styles - Motivation: Concepts, theories - Communicating: Types of communications - Communication process - Barriers - Effective Communication. Controlling: Objectives - Process of Controlling - Requirements for Effective Control - Types of control - Control Techniques.

TOTAL: 45

REFERENCES :

1. Varshney and Maheshwari, "Managerial Economics", Sultan Chand & Sons, 2004.
2. Dewett K.K., "Modern economic theory", S. Chand & Company, 2003.
3. Koontz, Weihrich and Aryasri "Essentials of Management", Tata McGraw-Hill, 2004.
4. Tripathi P.C., and Reddy, P.N., "Principles of Management", Tata McGraw Hill Co., 2004 Prasad L.M, " Principles of Management", Sultan Chand

EE 402	**HIGH VOLTAGE ENGINEERING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To understand the cause for overvoltages/currents in power systems.
- To understand the principle behind generation and measurement of overvoltages and currents.
- To understand the dielectric breakdown phenomena in gases, liquids and solid dielectrics.

Unit 1. OVERVOLATGES AND INSULATION COORDINATION 6

Natural causes of over voltages - lightning phenomena - over voltages due to switching surges - system faults and other abnormal conditions - principles of insulation co-ordination.

Unit 2. ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 12

Classical gas laws - ionization and decay processes - secondary effects - Paschen's law - streamer theory - breakdown in non-uniform fields and corona discharges - practical considerations in using gases for insulation purposes - vacuum insulation. Conduction and breakdown in pure and commercial liquids. Intrinsic breakdown in solids - electromechanical breakdown - thermal breakdown - breakdown in composite dielectrics.

Unit 3. GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of high DC voltage, alternating voltage, impulse voltages and impulse currents.

Unit 4. MEASUREMENT OF HIGH VOLTAGE AND HIGH CURRENTS 9

Measurement of high voltages and high currents - digital techniques in high voltage measurement.

Unit 5. HIGH VOLTAGE TESTING 9

High voltage testing of electrical power apparatus - power frequency, impulse voltage and DC, International and Indian Standards.

L = 45, TOTAL = 45

TEXT BOOKS

1. M.S. Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 2nd Edition, 1995.

2. Kuffel, E and Zaengl, W.S, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, 1986.

REFERENCES

1. Kuffel, E and Abdullah, M., 'High Voltage Engineering', Pergamon Press, Oxford, 1970.

2. Gallghar, P.J. and Pearmain, A.J., 'High Voltage Measurement', Testing and Design, John Wiley and Sons, New York, 1982.

EE 403 EVOLUTIONARY COMPUTING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce and apply the concepts of Artificial Neural Networks.
- To expose the students to fuzzy logic theory

Unit 1. INTRODUCTION TO NEURAL NETWORK 9

ANN technology - principles and promises - perceptron - representation - linear separability - learning - training algorithm - the Back-propagation network - the generalized delta rule - practical consideration - BPN applications.

Unit 2. COUNTER PROPAGATION NETWORK AND SELF-ORGANIZING MAP 9

CPN building blocks - CPN data processing - An image classification example. SOM data processing - application of SOMs.

Unit 3. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS 9

Introduction - Simple Genetic Algorithm - Reproduction,. Crossover, Mutation, Advanced Operators in Genetic Search - Applications to voltage Control and Stability Studies.

Unit4. FUZZY MATHEMATICS 9

Crispness - vagueness - Fuzziness - uncertainty - fuzzy set theory - Fuzzy set - Basic definitions - Fuzzy Relations- Solution of Fuzzy relational equations - Measures of Fuzziness -The extension principles and applications.

Unit 5. APPLICATIONS OF NEURAL NETWORK AND FUZZY LOGIC 9

Application to Control problems -Case studies - Control of Inverted Pendulum - Load frequency control problem in power systems- Steam Turbine Control..

TEXT BOOK

1. Wassermann, P. D. "Neural Computing" Van Reinhold, 1988.
2. Zimmermann, H. J., 'Fuzzy Set Theory and Its Applications', 2nd Edition,Kluwer Academic Publishers.

REFERENCES

1. Bose N.K, Liang P. 'Neural Network Fundamentals with graphs, Algorithms and applications', TMH Pub. Co. Ltd, 2001.

2. James .A. Freeman and D.S.Skapura, 'Neural Networks: - Algorithms, Applications and Programming Techniques', Addison Wesley Publishing Company, 1991.

3. IEEE tutorial on application of Neural Network to Power systems 1996.

4. George Klir & Tina. A. Folger, 'Fuzzy Sets, Uncertainty and Information', Prentice Hall of India Pvt. Ltd.

EE 404 POWER SYSTEM SIMULATION LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

- To study and develop programs for steady state analysis of Power systems using Newton-Raphson method Fast decoupled method.
- To study and analyze transient stability of power systems
- To study and analyze electromagnetic transients in power systems.

LIST OF EXPERIMENTS:

1. Computation of Parameters and Modeling of Transmission Lines
2. Formation of Network Matrices and Solution of Networks.
3. Power Flow Analysis - I: Solution of Power Flow and Related Problems using Gauss-Seidel Method.
4. Power Flow Analysis II: Solution of Power Flow and Related Problems Using Newton-Raphson and Fast-Decoupled Methods.
5. Short Circuit Analysis.
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System.
7. Transient Stability Analysis of Multimachine Power Systems.
8. Electromagnetic Transients in Power Systems.
9. Load - Frequency Dynamics of Single and Two-Area Power Systems.
10. Unit Commitment and Economic Dispatch in Power Systems.

EE 405	COMPREHENSION	L T P C 0 0 3 1

The objective of comprehension is to provide opportunity for the student to

apply the knowledge acquired during the academic programme to real -life problems that he/she may have to face in future as an engineer.

Three periods per week shall be allotted in the time table for this activity and this time shall be utilized by the student to receive guidance form the members of faculty on solving real-life problems, practice solving these problems and on group discussions, seminar presentations, library reading as assigned by the faculty member in-charge. The continuous assessment and semester evaluation may be carried out as specified in the guidelines to be issued from time to time. For which,

1. Two written tests of objective type question from the courses up to 6th semester may be conducted.
2. Seminars on latest topics may be conducted.
3. Oral Exams on G.K, Technical knowledge, reasoning, may be conducted.
4. Group discussions may be conducted.

EE 407	SOLID STATE DRIVES	L T P C 3 0 0 3

OBJECTIVES:

- To understand the stable steady-state operation and transient dynamics of a motor-load System.
- To study and analyze the operation of the converter / chopper fed dc drive.
- To study and understand the operation of both classical and modern induction motor Drives.
- To understand the differences between synchronous motor drive and induction motor drive.

Unit 1. DRIVE CHARACTERISTICS 6

Mechanical characteristics- constant torque and constant HP operations - Four quadrant operation - Rating of motors - selection of drives.

Unit 2. DC DRIVES 10

Single phase and three-phase converter fed drives - continuous and discontinuous conduction modes - chopper fed drives- four-quadrant operation - closed loop drive system.

Unit 3. STATOR CONTROLLED INDUCTION MOTOR DRIVES 12

Voltage controlled drive - V/f control - VSI and CSI fed drives - closed loop control - braking methods for induction motors.

Unit 4. ROTOR CONTROLLED INDUCTION MOTOR DRIVES 8

Rotor resistance control - slip power recovery scheme - sub synchronous and super synchronous operations - power factor improvement - closed loop control.

Unit 5. SYNCHRONOUS MOTOR DRIVES 9

Adjustable frequency and controlled current operation- self controlled synchronous motor - closed loop control - power factor control - brushless excitation

L = 45, T=0, TOTAL = 45

TEXT BOOKS

1. Dubey. G.K., 'Power Semiconductor Drives', Prentice Hall International, 1989.

2. Vedam Subrahmaniyam, 'Electric drives concepts and applications', TMH Pub. Co.Ltd., 1994.

REFERENCES

1. Murphy, J.M.D and Turnbull.F.G., 'Thyristor control of AC Motors', Pergamon Press, 1988.

2. Sen. P.C., 'Thyristor D.C. Drives', John Wiley and Sons, 1981.

3. B. K. Bose, 'Power Electronics and AC Drives', Prentice Hall Onglewood cliffs, New Jersey, 1986.

EE 408 POWER QUALITY AND ENERGY CONSERVATION L T P C

3 0 0 3

OBJECTIVES:

- To impart knowledge on Power quality and energy conservation in various electric applications like heating, lighting and vehicles.
- Electrical energy conservation, energy auditing and power quality.
- Harmonics and its effects

Unit 1. ELECTRIC HEATING 9

Resistance heating - induction heating - dielectric heating - arc furnace - energy conservation in arc furnace industry and welding - electro-chemical processes.

Unit 2. ELECTRIC LIGHTING 9

Definition of terms - types of lamp - types of lighting - design of illumination - residential - commercial - industrial - energy saving measures.

Unit 3. ELECTRIC VEHICLE 9

Railway electrification - definition and analysis of traction effort - speed - time curve - traction motors - battery driven vehicles - energy efficiency drives - advanced speed control measures.

Unit 4: INTRODUCTION TO POWER QUALITY 9

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT 5 VOLTAGE SAGS AND HARMONICS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags mitigation of voltage sags harmonics -

Harmonic distortion: Voltage and current distortion, harmonic sources from commercial and industrial loads, locating harmonic sources, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

L = 45 T=0
Total = 45

TEXT BOOKS

1. Tripathy, S.C., 'Electric Energy Utilisation and Conservation', Tata McGraw Hill Publishing Company Ltd. New Delhi, 1991.

2. Soni, M.L., P.V. Gupta and Bhatnagar, 'A Course in Electrical Power', Dhanpat Rai Sons, New Delhi, 1983.

3. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.

REFERENCES

1. Partab, H., 'Art and Science of Utilisation of Electrical Energy', Dhanpat Rai and Sons, New Delhi, 1986.

2. Wadhwa, S.L., 'Generation, Utilisation and Distribution', Wiley Eastern Ltd., 1992.

3. Suryanarayana, N.V., 'Utilisation of Electric Power', Wiley Eastern Ltd. 1993.

EE 410	**PROJECT WORK**	**L T P C**
		0 0 12 6

The objective of project work is to enable the students, to work in convenient groups of not more than four members in a group, on a project involving some design and fabrication work or theoretical and experimental studies related to the respective engineering discipline.

Every project work shall have a Guide who is a member of the faculty. Twelve periods per week shall be allotted in the time table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis, or field work as assigned by the Guide and also to present in periodical seminars or viva to review the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature - survey, problem statement, project work details, estimation of cost and conclusions. This final report shall be in typewritten form as specified in the guidelines.

The continuous assessment and semester evaluation is to be carried out as specified in the guidelines to be issued from time to time.

LIST OF ELECTIVES

GROUP I

EE 025 EHV AC AND DC TRANSMISSION ENGINEERING

L	T	P	C
3	0	0	3

Unit 1. TRANSMISSION ENGINEERING **9**

Transmission line trends - standard transmission voltages - Power handling capacity and line losses - cost of transmission lines and equipment - Mechanical consideration - Transmission Engineering principles.

Unit 2. LINE PARAMETERS **9**

Calculation of Line and ground parameters - Resistance, Capacitance and inductance calculation - Bundle conductors - Modes of propagation - Effect of earth.

Unit 3. POWER CONTROL **9**

Power Frequency and Voltage control - Over voltages - Power Circle diagram - Voltage control using shunt and series compensation - static VAR compensation - higher phase order system - FACTS.

Unit 4. EHV AC TRANSMISSION **9**

Design of EHV lines based on steady state limits and transient over voltages - Design of extra HV cable transmission - XLPE cables - Gas insulated cable Corona and RIV.

Unit 5. HVDC TRANSMISSION **9**

HVDC transmission principles - Comparison of HVAC and HVDC Transmission - Economics - Types of converters - HVDC Links - HVDC Control - Harmonics - Filters - Multi terminal DC system - HVDC cables and HVDC circuit breakers.

L = 45 T=0 Total = 45

TEXT BOOKS

1. Rakosh Das Begamurde, 'Extra HVAC Transmission Engineering', Wiley Eastern. Madras,1990.

2. Padiyar, K.R. 'HVDC Power Transmission Systems', Wiley Eastern Ltd., Madras 1993.

REFERENCES

1. Allan Greenwood, 'Electrical Transients in Power Systems', John Wiley and Sons New York, 1992

2. Arrilaga, J., 'HVDC Transmission', Peter Peregrines Ltd., London 1983.

EE 026 POWER SYSTEM DYNAMICS L T P C

3 0 0 3

Unit 1. INTRODUCTION **4**

Concept and importance of stability in power system operation and design; distinction between transient and dynamic stability; complexity of stability problem in large system: Need for reduced models; stability of interconnected systems.

Unit 2. MACHINE MODELLING **12**

Park's transformation; flux linkage equations, current space model, per unit conversion, normalizing the equations, equivalent circuit, flux linkage state space model, sub transient and transient inductances and time constants. Simplified models (one axis and constant flux linkage), steady state equations and phasor diagrams.

Unit 3. MACHINE CONTROLLERS **9**

Exciter and voltage regulators, function of excitation systems, types of excitation systems, typical excitation system configuration, block diagram and state space representation of IEEE type 1 excitation system, saturation function, stabilizing circuit.

Function of speed governing systems, block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

Unit 4. TRANSIENT STABILITY **8**

State equation for multimachine simulation with one axis model, transient stability simulation of multimachine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique), power system stabilizer.

Unit 5. DYNAMIC STABILITY **12**

System response to small disturbances: Linear model of the unregulated synchronous machine and its modes of oscillation, regulated synchronous machine, distribution of power impact, linearization of the load equation for the one machine problem - Simplified linear model, effect of excitation on dynamic stability, approximate system representation; supplementary stabilizing signals, dynamic performance measure, small signal performance measures.

L = 45 Total = 45

TEXT BOOKS

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', IEEE Press, 2002.

2. P.Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994.

REFERENCE BOOK

1. M.A.Pai and P.W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.

EE 027 POWER SYSTEM TRANSIENTS

L	T	P	C
3	0	0	3

Unit 1. INTRODUCTION AND SURVEY **5**

Source of transients, various types of power systems transients, effect of transients on power systems, importance of study of transients in planning.

Unit 2. SWITCHING TRANSIENTS **10**

Introduction, circuit closing transients: RL circuit with sine wave drive, double frequency transients, observations in RLC circuit and basic transforms of the RLC circuit. Resistance switching: Equivalent circuit for the resistance switching problems, equivalent circuit for interrupting the resistor current. Load switching: Equivalent circuit, waveforms for transient voltage across the load, switch; normal and abnormal switching transients. Current suppression, current chopping, effective equivalent circuit. Capacitance switching, effect of source regulation, capacitance switching with a re strike, with multiple restrikes, illustration for multiple restriking transients, ferro resonance.

Unit 3. LIGHTNING TRANSIENTS **10**

Causes of over voltage, lightning phenomenon, charge formation in the clouds, rate of charging of thunder clouds, mechanisms of lighting strokes, characteristics of lightning strokes; factors contributing to good line design, protection afforded by ground wires, tower footing resistance. Interaction between lightning and power system: Mathematical model for lightning.

Unit 4. TRAVELLING WAVES ON TRANSMISSION LINES **10**

Computation of transients: Transient response of systems with series and shunt lumped parameters and distributed lines. Travelling wave concept: step response, Bewely's lattice diagram, standing waves and natural frequencies, reflection and refraction of travelling waves.

Unit 5. TRANSIENTS IN INTEGRATED POWER SYSTEM **10**

The short line and kilometric fault, distribution of voltage in a power system: Line dropping and load rejection; voltage transients on closing and reclosing lines; over voltage induced by faults; switching surges on integrated system; EMTP for transient computation.

L = 45 Total = 45

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Interscience, New York, 2nd edition 1991.

2. R.D.Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCE BOOK

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 2nd edition, 2000.

EE 028	SOLID STATE RELAYS	L	T	P	C
		3	0	0	3

Unit 1 Introduction **9**

General Introductions - Basic construction - characteristics - advantages

Unit 2 Directional and Over current Relays **9**

Phase and Amplitude Comparator - instantaneous and time-current types - basic principles - practical circuits - Examples

Unit 3 Differential and Distance relays **9**

Characteristics - Types - Analysis - Transformer Protection - Types and requirements of distance relays - various schemes - examples.

Unit 4 Pilot Wire Scheme and Carrier Current Schemes **9**

Types - Practical Circuits - Carrier Current Protection - Applications - Typical Examples.

Unit 5 Microprocessor Application to Protection **9**

Architecture - Memories - Flip-flops and multi vibrators - Some examples of micro processor application based on theoretical developments.

Text Book:

1. T S Madhava Rao, Power system protection: static relays with micro processor applications, Tata-McGraw Hill, Second Edition,1989.

EE 029 ADVANCED CONTROL SYSTEMS **L T P C**
3 0 0 3

Unit 1 STATE VARIABLE ANALYSIS AND DESIGN 10

State models - solution of state equations- controllability and observability - pole assignment by state feedback - full and reduced order observers.

Unit 2 NONLINEAR SYSTEMS 10

Common types of non-linear phenomena - Linearization - singular points - phase plane method - construction of phase trajectories - system analysis by phase plane method - describing function method - describing function of nonlinear elements - stability analysis by describing function method - jump resonance - Lyapunov's and Popov's stability criteria.

Unit3 OPTIMAL CONTROL 10

Problem formulation - necessary conditions of optimality - state regulator problem -

Matrix Riccati equation - infinite time regulator problem - output regulator and tracking

problems - Pontryagin's minimum principle - time-optimal control problem.

Unit4 DIGITAL CONTROL SYSTEM 7

Characteristics of sampling - Data extrapolation - Review of Z transform theory Characteristic response of a sample and ZOH combination - stability analysis by mathematical tests and root locus diagrams - design using Root loci.

Unit 5 ALGORITHM AND STRATEGY FOR COMPUTER CONTROL 8

Scaling data - linearization of input data - arithmetical operations and functions - integration - control law algorithm - PID control law - self-tuning strategy.

L = 45 T=0 Total = 45

TEXT BOOKS

1. M. Gopal, 'Digital Control and State Variable Methods', Tata McGraw-Hill, 1997

REFERENCES

1. R.C.Dorf and R.H.Bishop, 'Modern Control Systems', Addison-Wesley, 1995 (MATLAB Reference)
2. Nagrath, I.J. and Gopal, M., 'Control System Engineering', Wiley Eastern, Reprint 1995.
3. K. Ogata, 'Modern Control Engineering', PHI, III Edition.

GROUP II

EE 030 SPECIAL ELECTRICAL MACHINES **L T P C 3 0 0 3**

Unit 1 SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features - Types - Axial and radial air gap motors - Operating principle - Reluctance - Phasor diagram - Characteristics - Vernier motor.

Unit 2 STEPPING MOTORS 9

Constructional features - Principle of operation - Variable reluctance motor - Hybrid motor - Single and multi stack configurations - Theory of torque predictions - Linear and non-linear analysis - Characteristics - Drive circuits.

Unit 3 SWITCHED RELUCTANCE MOTORS 9

Constructional features - Principle of operation - Torque prediction - Power controllers - Non-linear analysis - Microprocessor based control - Characteristics - Computer control.

Unit 4 PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Principle of operation - Types - Magnetic circuit analysis - EMF and torque equations - Power controllers - Motor characteristics and control.

Unit 5 PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation - EMF and torque equations - Reactance - Phasor diagram - Power controllers - Converter - Volt-ampere requirements - Torque speed characteristics - Microprocessor based control.

L = 45 Total = 45

TEXT BOOKS

1. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
2. P.P. Aearnley, 'Stepping Motors - A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCE BOOKS

1. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.

EE 031 COMPUTER AIDED DESIGN OF ELECTRICAL APPARATUS **L T P C 3 0 0 3**

Unit 1 INTRODUCTION **5**

Conventional design methodology - computer aided design aspects - Advantages.

Unit 2 ELECTROMAGNETICS AND ELECTROSTATICS **5**

Basic field equations - calculation of field distribution - flux linkages - voltage induced - inductance - capacitance - force / torque.

Unit 3 CAD PACKAGES **10**

Recent developments - preprocessing - modeling - boundary conditions - material characteristics - problem formulation - solution - post processing.

Unit 4 FINITE ELEMENT ANALYSIS **10**

Mathematical formulation - discretisation - shape functions - stiffness matrix - solution techniques - post processing.

Unit 5 DESIGN EXAMPLES (PRACTICALS) **30**

Design of actuator - solenoid - transformer - induction motor - switched reluctance motor - stepper motor - P.M. machines.

L = 30 P = 30 Total = 60

TEXT BOOK

1. P.P. Silvester and Ferrari, 'Finite Element for Electrical Engineers', Cambridge University Press, 1984.

REFERENCES

1. D.A. Lowther and P.P. Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, Newyork, 1986.
2. M.V.K. Chari and P.P. Silvester, "Finite Elements in Electric and Magnetic Field Problems", John Wiley, 1980.

EE 032 SOFTWARE FOR CIRCUIT SIMULATION

L	T	P	C
3	0	0	3

Unit 1 Introduction **9**

Circuit elements - one line diagram - specification of semi conductor devices - revision

Unit 2 PSPICE **9**

Introduction to PSPICE - notation of circuit elements in PSPICE - small examples - simulation of circuits: rectifiers, oscillators etc.,

Unit 3 PSIM **9**

Introduction to PSIM - Modeling devices using PSIM - applications

Unit 4 MAGNET **9**

Introduction to MAGNET - Modeling machine parameters using MAGNET - applications.

Unit 5 Application **9**

Solution to typical problems involving PSPICE, PSIM and MAGNET,

Text Books

Manual of PSPICE

Manual of PSIM

Manual of MAGNET

EE 033 INTELLIGENT CONTROLLERS

L	T	P	C
3	0	0	3

1. NEURAL NETWORK ARCHITECTURES **9**

Introduction - Biological neuron - Artificial neuron - Neuron modeling - Learning rules - Single layer - Multi layer feed forward network - Back propagation - Learning factors.

2. NEURAL NETWORKS FOR CONTROL **9**

Feed back networks - Discrete time hop field networks - Transient response of continuous time networks - Applications of artificial neural network - Process identification - Neuro controller for inverted pendulum.

3. FUZZY SYSTEMS **9**

Classical sets - Fuzzy sets - Fuzzy relations - Fuzzification - Defuzzification - Fuzzy rules.

4. FUZZY LOGIC CONTROL **9**

Membership function - Knowledge base - Decision-making logic - Optimisation of membership function using neural networks - Adaptive fuzzy system - Introduction to genetic algorithm.

5. APPLICATION OF FLC **9**

Fuzzy logic control - Inverted pendulum - Image processing - Home heating system - Blood pressure during anesthesia - Introduction to neuro fuzzy controller.

L = 45 Total = 45

TEXT BOOKS

1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 1997.

REFERENCE BOOKS

1. Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education, 1992.

2. H.J. Zimmermann, 'Fuzzy Set Theory & its Applications', Allied Publication Ltd., 1996.

3. Simon Haykin, 'Neural Networks', Pearson Education, 2003.

4. John Yen & Reza Langari, 'Fuzzy Logic - Intelligence Control & Information', Pearson Education, New Delhi, 2003.

EE 034 FLEXIBLE AC TRANSMISSION SYSTEMS

L	T	P	C
3	0	0	3

Unit 1. INTRODUCTION **9**

FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.

Unit 2. SERIES COMPENSATION SCHEMES **9**

Sub-Synchronous resonance, Torsional interaction, Torsional torque, Compensation of conventional, ASC, NGH damping schemes, modeling and control of thyristor controlled series compensators.

Unit 3. UNIFIED POWER FLOW CONTROL **9**

Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.

Unit 4. DESIGN OF FACTS CONTROLLERS **9**

Approximate multi-modal decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, and variable structure resistor control.

Unit 5. STATIC VAR COMPENSATION **9**

Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor (TSR), Thyristor switched capacitor (TSC), saturated reactor (SR), Fixed Capacitor (FC).

L = 45 TOTAL = 45

REFERENCES

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40- 45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems " IEEE High Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.

4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.

5. Gyugyi L., "Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

GROUP III

EE 035 VISUAL LANGUAGES AND ITS APPLICATIONS TO ELECTRICAL ENGINEERING

L	T	P	C
3	0	0	3

Unit 1. HISTORICAL DEVELOPMENT OF PROGRAMMING 5

Procedural programming - structural programming - object oriented programming - Windows programming - event driven programming - conceptual comparison.

Unit 2. WINDOWS PROGRAMMING 10

Overview of windows programming - Data types - Resources controls - Windows messages - Devices contexts - Document interfaces - Dynamic link libraries - SDK (Software development kit tools) - Context help.

Unit 3. VISUAL BASIC PROGRAMMING 10

Form design - Overview - Programming fundamentals - VBX controls - Graphics applications - Animation - Interface - File system control - Data control - Database application.

Unit 4. VISUAL C++ PROGRAMMING 10

Frame work classes - VC++ components - Resources handling - Event handling - Message dispatch system model and model-less dialogues - Importing VBX controls - Document view architecture - Sterilization - Multiple document - Splitter windows -Co-ordination between controls - Sub classing.

Unit 5. CASE STUDIES 10

Application to Electrical Engineering problems.

L = 45
Total = 45

TEXT BOOKS

1. David Kurlinski, J., 'Inside Visual C++', Microsoft press 1993.
2. Microsoft Visual C++ and Visual Basic Manuals

REFERENCES

1. Plewold, 'Windows Programming'.
2. Holznek, 'Visual C++ Programming', Heavy metal

EE 036 ROBOTICS AND AUTOMATION

L	T	P	C
3	0	0	3

Unit1. INTRODUCTION TO ROBOTICS **9**

Automation and Robotics - Robot Anatomy - Classification of Robots by Configuration and Control -Basic Components of Robots system - manipulators, wrists, end effectors, power, control units - robot sensors, Force sensors - Introduction to AI - Legged Locomotion.

Unit 2. ROBOT MOTION ANALYSIS AND CONTROL **9**

Introduction to manipulator Kinematics - Homogeneous transformation and Robot Kinematics - Robot dynamics - Manipulator path controller- configuration of a Robot controller - Control of a Robot joint.

Unit 3. ROBOT DRIVE SYSTEMS **9**

Introduction to Robot drives - Electric , Hydraulic and Pneumatic - Electrical actuators - Stepper motors, stepper motor drives, linear stepper motors , Brushless DC motors, Direct Drive Actuators - Hydraulic Actuators - Pneumatic drives - Servo Amplifiers.

Unit 4. MACHINE VISION FOR ROBOTICS **9**

Introduction to Machine Vision - Image Acquisition - Illumination Techniques - Imaging geometry - Some basic relationship between pixels- Analog to Digital signal conversion - Image storage - Image processing and analysis preprocessing, segmentation , feature extraction , Recognition, Interpretation.

Unit 5. ROBOT PROGRAMMING AND APPLICATIONS **9**

Methods of Robot programming - lead through programming methods - A robot program as a path in space - motion interpolation - weight, signal and delay commands - Branching capabilities - Robot programming examples for pick and place application using VAL - Application of robots in material handing, processing operations, assembly and inspection - future applications of robots.

L = 45 T=0 Total = 45

TEXT BOOKS

1. Mikell P. Groover, Milchel Wein Roger Nnagel and Nicholas G. Ordy, 'Industrial Robotics, Technology, Programming and Applications', McGraw Hill, Last Print 1987.

REFERENCES

1. B. Siciliano, 'Modelling and Control of Robot manipulators, Tata McGraw-Hill, 1996.
2. M.W.Spong and M. Vidyasagar, 'Robot Dynamics and control', John Wiley and Sons, 1989.
3. J.J.Graig, 'Introduction to Robotics, Mechanics and Control', Addison Wesley Pub. 1989.

EC 037 EMBEDDED SYSTEM DESIGN

L	T	P	C
3	0	0	3

Unit 1. INTRODUCTION TO EMBEDDED SYSTEM 9

Introduction to functional building blocks of embedded systems - Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

Unit 2. PROCESSOR AND MEMORY ORGANIZATION 6

Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management - Cache mapping techniques, dynamic allocation - Fragmentation.

Unit 3. DEVICES & BUSES FOR DEVICES NETWORK 9

I/O devices; timer & counting devices; serial communication using I2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system - Serial port & parallel port.

Unit 4. I/O PROGRAMMING SCHEDULE MECHANISM 12

Intel I/O instruction - Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming - Context switching, premature & non-premature multitasking, semaphores.

Scheduling - Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

Unit 5. REAL TIME OPERATING SYSTEM (RTOS) 9

Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS - Interrupt handling, task scheduling; embedded system design issues in system development process - Action plan, use of target system, emulator, use of software tools.

L = 45 Total = 45

TEXT BOOKS

1. Rajkamal, 'Embedded System - Architecture, Programming, Design', Tata McGraw Hill, 2003.

2. Daniel W. Lewis 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

REFERENCE BOOKS

1. David E. Simon, 'An Embedded Software Primer', Pearson Education, 2004.

2. Frank Vahid, 'Embedded System Design - A Unified Hardware & Software Introduction', John Wiley, 2002.

3. Sriram V. Iyer, Pankaj Gupte, 'Embedded Real Time Systems Programming', Tata McGraw Hill, 2004.

4. Steve Heath, 'Embedded System Design', II edition, Elsevier, 2003.

EE 038 FIBRE OPTICS AND LASER INSTRUMENTS

L	T	P	C
3	0	0	3

Unit 1. OPTICAL FIBRES AND THEIR PROPERTIES 12

Principles of light propagation through a fiber - Different types of fibres and their properties, fibre characteristics - Absorption losses - Scattering losses - Dispersion - Connectors & splicers - Fibre termination - Optical sources - Optical detectors.

Unit 2. INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors - Fibre optic instrumentation system - Different types of modulators - Interferometric method of measurement of length - Moire fringes - Measurement of pressure, temperature, current, voltage, liquid level and strain.

Unit 3. LASER FUNDAMENTALS 9

Fundamental characteristics of lasers - Three level and four level lasers - Properties of laser - Laser modes - Resonator configuration - Q-switching and mode locking - Cavity damping - Types of lasers - Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

Unit 4. INDUSTRIAL APPLICATION OF LASERS 6

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect - Material processing - Laser heating, welding, melting and trimming of material - Removal and vaporization.

Unit 5. HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography - Basic principle - Methods - Holographic interferometry and application, Holography for non-destructive testing - Holographic components - Medical applications of lasers, laser and tissue interactive - Laser instruments for surgery, removal of tumours of vocal cards, brain surgery, plastic surgery, gynecology and oncology.

L= 45 Total = 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication - Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Donald J.Sterling Jr, 'Technicians Guide to Fiber Optics', 3rd Edition, Vikas Publishing House, 2000.
2. M. Arumugam, 'Optical Fiber Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968
5. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.

EE 039 MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)

L	T	P	C
3	0	0	3

Unit 1. Introduction **9**

An introduction to Microsensors and MEMS, Evolution of Microsensors & MEMS Microsensors & MEMS applications.

Unit 2. Technologies **9**

Microelectronic technologies for MEMS, Micromachining Technology, Surface and Bulk Micromachining, Micromachined Micro sensors.

Unit 3. Types of MEMS **9**

Mechanical, Inertial, Biological, Chemical, Acoustic, Microsystems Technology

Unit 4. Manufacturing **9**

Integrated Smart Sensors and MEMS, Interface Electronics for MEMS.

Unit 5. MEMS Applications **9**

MEMS Simulators, MEMS for RF Applications, Bonding & Packaging of MEMS, Conclusions & Future Trends.

Text Books:

1. Microsystem Design, Stephen D. Senturia, Kluwer, Boston, 2001
2. Micromachined Transducers - Sourcebook, Greg Kovacs, McGraw, New York,1998

EE 040 VLSI DESIGN L T P C
3 0 0 100

Unit 1. BASIC MOS TRANSISTOR 9

Enhancement mode & Depletion mode - Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology - NMOS transistor current equation - second order effects - MOS Transistor Model.

Unit 2. NMOS & CMOS INVERTER AND GATES 9

NMOS & CMOS inverter - Determination of pull up / pull down ratios - stick diagram - lamda based rules - super buffers - BiCMOS & steering logic.

Unit 3. SUB SYSTEM DESIGN & LAYOUT 9

Structured design of combinational circuits - Dynamic CMOS & clocking - Tally circuits - (NAND-NAND, NOR-NOR and AOI logic) - EXOR structure - Multiplexer structures - Barrel shifter.

Unit 4. DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAY LOGIC 9

NMOS PLA - Programmable Logic Devices - Finite State Machine PLA - Introduction to FPGA.

Unit 5. VHDL PROGRAMMING 9

RTL Design - combinational logic - Types - Operators - Packages - Sequential circuit - Sub programs - Test benches. (Examples: address, counters, flip-flops, FSM, Multiplexers / Demulti-plexers).

L = 45 Total = 45

TEXT BOOKS

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2003.

2. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.

REFERENCE BOOKS

1. N.H.Weste, 'Principles of CMOS VLSI Design', Pearson Education, India, 2002.

2. Charles H.Roth, 'Fundamentals of Logic Design', Jaico Publishing House, 1992.

3. Zainalatsedin Navabi, 'VHDL Analysis and Modelling of Digital Systems', 2nd Edition, Tata McGraw Hill, 1998.

4. Douglas Perry, 'VHDL Programming By Example', Tata McGraw Hill, 3rd Edition.

GROUP IV

EE 041	SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL DESIGN	L	T	P	C
		3	0	0	3

Unit 1. SYSTEMS AND MODELS **9**

Models of LTI systems: Linear Models-State space Models, Model sets, Structures and Identifiability-Models for Time-varying and Non-linear systems: Models with Nonlinearities - Non-linear state-space models-Black box models, Fuzzy models, Model approximation and validation-Random Process Modeling.

Unit 2. PARAMETRIC AND NON-PARAMETRIC ESTIMATION METHODS 9

Transient response and Correlation Analysis - Frequency response analysis - Spectral Analysis - Least Square - Recursive Least Square -Maximum Likelihood - Instrumental Variable methods - Pseudo Linear Regression

Unit 3. LINEAR AND NON-LINEAR ESTIMATION TECHNIQUES **9**

Open and Closed loop identification: Approaches - Direct and indirect identification - Joint input-output identification - Non-linear system identification - Wiener models - Power series expansions - Multidimensional Identification - State estimation techniques - FFT based, Model based Spectral estimation techniques.

Unit 4. CLASSIFICATION OF ADAPTIVE CONTROL **9**

Introduction - Uses - Auto tuning - Self Tuning Regulators (STR) - Model Reference Adaptive Control (MRAC) - Types of STR and MRAC - Different approaches to self-tuning regulators - Stochastic Adaptive control - Gain Scheduling.

Unit 5. APPLICATIONS OF ADAPTIVE CONTROL **9**

Recent trends in self - tuning - Stability, Convergence and Robustness studies - Model Updating - General purpose Adaptive regulator - Applications to process control.

L = 45 TOTAL = 45

Text Books

1. Ljung," System Identification Theory for the User", PHI, 1987.
2. Rolf Johansson," System Modelling and Identification", Prentice Hall of India,
3. Astrom and Wittenmark," Adaptive Control ", PHI
4. William S. Levine, " Control Hand Book".
5. Narendra and Annasamy," Stable Adaptive Control Systems, Prentice Hall, 1989.

EE 042 OPERATIONS RESEARCH L T P C
3 0 0 3

Unit 1.

Operations Research Models - Operations Research Techniques - Art of Modeling - Construction of LP Model - Graphical LP solution - Graphical Sensitivity Analysis - The Simplex Algorithm - The M- method - The two phase method - degeneracy - Alternative optima - unbounded solutions - infeasible solution - redundancies - LP packages.

Unit 2.

Definition of the Dual problem - primal-dual relationship - Economic interpretation of duality - Dual simplex method - primal dual computation - post optimal or sensitivity analysis - Changes affecting feasibility - Changes affecting optimality - Revised simplex method - LP packages.

Unit 3.

Definition of Transportation model - The transportation algorithm - Determination of the starting solution - Iterative computations of the Algorithm - The Assignment Model - The Hungarian method - The Transshipment model - Inter programming problem - Cutting plane Algorithm.

Unit 4.

Scope of Network Applications - Network solution - Minimal spanning tree Algorithm - Shortest Route problem - Examples - Shortest Route Algorithm - Maximal flow model - Minimum cost capacitated flow problems.

Unit 5.

Network diagram representation - Critical path method - Time estimates - Crashing - Time charts - PERT and CPM for project scheduling - Resource planning - Case studies.

TEXT BOOK

1. Handy A. Taha, "Operation Research - An Introduction", 7th Edition, Pearson Education, Asia, 2002.

REFERENCE BOOKS

1. Ronald. L. Rardin, "Optimization in Operation Research", Person Education, Asia, 2002.

2. JIT.S Chandran, Mahendran P. Kawatra Ki Ho Kim, "Essential of Linear Programming", Vikas Publishing House Pvt.Ltd., New Delhi, 1994.

3. Hiller F.S Liberman G.J, "Introduction to Operation Research", 6th Edition, McGraw Hill, 1995.

4. R.Panneer Selvam, "Operations Research", Prentice Hall of India, 2002.

5. P.C. Tulsin, "Quantitative Technique : Theory and Problem", Pearson Education, 2002.

6. Ravindran, Phillips, Solberg, "Operation Research Principles and Practice", Second Edition, John wiley, 1987.

EE 043 DATA BASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

Unit 1. INRODUCTION **5**

Need for Database systems - Data Models - Overall System structure - Entities and Entity sets - Relationships and Relationship sets - Mapping Constraints - Design of an E-R database scheme Structure of relational databases - Relational Algebra and Relational Calculus.

Unit 2. RELATIONAL MODEL **10**

Relational Commercial Languages-Integrity constraints pitfalls in Relational Database Design - Normalization using functional dependencies, multi-valued dependencies and join dependencies - Domain - key normal form - Alternative approaches to database design.

Unit 3. INDEXING AND HASHING **10**

Overall system structure - Physical storage media - File organization - Sequential files - Indexing -Static hash functions -Dynamic hash functions.

Unit 4. QUERY PROCESSING **10**

Query Interpretation - Equivalence of expressions - Join strategies - Failure classification - Storage hierarchy - Transaction model -Log based recovery - Buffer Management - Shadow paging - Control.

Unit 5. SECURITY AND INTEGRITY **10**

Security and Integrity Violations - Authorization and views - security specification in SQL.

CASE STUDIES

IMS system architecture - DBTG codasyl model.

L = 45 T=0 Total = 45

TEXT BOOK

1. Henry Forth F. and Abraham Silbrerschatz, 'Data Base System Concepts', Second Edition, McGraw Hill International Editions, 1991.

REFERENCES

1. Date C. J. "Introduction to Database system", Third Edition, Vol.1. Addison-Wesley Publishing Company Inc., Narosa, 1989.

2. Stetano Ceri and Giuseppe Pelagatti, 'Distributed Databases Principles and Systems', International Student Edition, McGraw Hill, 1985.

EE 044 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

Unit 1. INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership - Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

Unit 2. TQM PRINCIPLES 9

Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures - Basic Concepts, Strategy, Performance Measure.

Unit 3. STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals - Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

Unit 4. TQM TOOLS 9

Benchmarking - Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.

Unit 5. QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System Elements, Implementation of Quality System, Documentation, Quality Auditing, QS9000, ISO 14000 - Concept, Requirements and Benefits.

L = 45 Total = 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCE BOOKS

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).

2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.

3. Oakland.J.S. "Total Quality Management Butterworth - Hcinemann Ltd., Oxford. 1989.

4. Narayana V. and Sreenivasan, N.S. Quality Management - Concepts and Tasks, New Age International 1996.

5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991.

EE 045 INTERNET TECHNOLOGY L T P C
3 0 0 3

Unit 1. COMPUTER NETWOKS 9

Introduction to networks - Network topology - Types of networks - Network architecture - Layering - Design issues - Client/Server model - Protocols - Bridges - Routers - Repeaters - Switches.

Unit 2. BASICS OF INTERNETWORKING 9

Introduction to internetworking - Internetworking concepts and architectural model - Internet addressing - Domain Name System (DNS) - Address Resolution Protocol (ARP) - Reverse Address Resolution Protocol (RARP).

Unit 3. INTERNET PROTOCOL AND ITS ROUTING 9

Introduction to IP protocol - Virtual networks - Concept of unreliable delivery - Connectionless delivery system - Purpose on internet protocol - Internet data gram - Data gram options. Introduction to routing - IP data gram - Direct and indirect delivery- Table driven IP routing - Next hop routing.

Unit 4. TRANSMISSION CONTROL PROTOCOL 9

Introduction to TCP - Properties of reliable delivery service - TCP protocol - TCP segment format - TCP connection - TCP state machine - Silly window syndrome.

Unit 5. INTERNETWOKING APPLICATIONS 9

Simple Mail Transfer Protocol (SMTP) - Post Office Protocol (POP) - File Transfer Protocol (FTP) - Telnet - Simple Network Management Protocol (SNMP) - Internet security and firewall design.

L = 45 Total = 45

TEXT BOOKS

1. Douglas E. Comer, 'Internetworking with TCP/IP Volume 1', Third Edition, Prentice Hall, 2001.

2. Andrew S.Tananbaum, 'Computer Networks', Fourth Edition, Prentice Hall of India/Pearson Education, 2003.

REFERENCE BOOKS

1. Bechrouz A. Forouzan, 'TCP/IP Protocol Suite', Second Edition, Tata McGraw Hill, 2000.

2. William Stallings, 'Data and Computer Communications', Seventh Edition, Prentice Hall of India/Pearson Education, 2003

EE 046 MOBILE COMMUNICATION

L	T	P	C
3	0	0	3

Unit 1. CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS **9**

Introduction to wireless communication: Evolution of Mobile Communications, mobile radio systems - Examples, trends in cellular radio and personal communications.

Cellular concept: Frequency reuse, channel assignment hand off, interference and system capacity, tracking and grade of service, improving coverage and capacity in cellular systems.

Unit 2. MOBILE RADIO PROPAGATION **9**

Free space propagation model, reflection, diffraction, scattering, link budget design, outdoor propagation models, indoor propagation models, small scale multipath propagation, impulse model, small scale multipath measurements, parameters of mobile multipath channels, types of small scale fading.

Unit 3. MODULATION TECHNIQUES AND EQUALIZATION **9**

Modulation techniques: Minimum shift keying, Gaussian MSK, M-ary QAM, performance of MSK modulation in slow-flat fading channels.

Equalization: Survey of equalization techniques, linear equalization, non-linear equalization, algorithms for adaptive equalization. Diversity Techniques, RAKE receiver.

Unit 4. CODING AND MULTIPLE ACCESS TECHNIQUES **9**

Coding: Vocoders, linear predictive coders, selection of speech coders for mobile communication, GSM coders. Multiple access techniques: FDMA, TDMA, CDMA, SDMA, capacity of cellular CDMA.

Unit 5. WIRELESS SYSTEMS AND STANDARDS **9**

Second generation and third generation wireless network and standards, WLL, blue tooth, GSM, IS- 95 and DECT.

L = 45 Total = 45

TEXT BOOKS

1. T.S. Rappaport, 'Wireless Communications: Principles and Practice', Second Edition, Prentice Hall of India/Pearson Education, Third Indian Reprint 2003.

REFERENCE BOOKS

1. R.Blake, 'Wireless Communication Technology', Thomson Delmar, 2003.
2. W.C.Y. Lee, 'Mobile Communications Engineering: Theory and Applications', Second Edition, McGraw Hill International, 1998.
3. Stephen G.Wilson, 'Digital Modulation and Coding', Pearson Education, 2003.

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