HINDUSTAN UNIVERSITY

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

(Estd. u/s 3 of the UGC Act, 1956)

Padur, Kancheepuram District - 603 103.

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM
&
SYLLABUS 2013-14

B.Tech.
ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC REGULATIONS (B.Tech)
(Full /Part Time) (Effective 2013-14)

1. Vision, Mission and Objectives

1.1 The Vision of the Institute is "To make every man a success and no man a failure".

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the Institute always strives

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the nation and the society.
- To promote research in the field of Science, Humanities, Engineering, Technology and allied branches.

1.3 Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied sciences and management.
- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

2. Admission

2.1 The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.Tech programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for foreign nationals shall be made available.

2.2 (i) Full-Time :

At the time of applying for admission, the candidates should have passed / appeared and be awaiting results of the final examination of the 10+2 system or its equivalent with Mathematics, Physics and Chemistry as subjects of study.

(ii) Part -Time:

At the time of applying for admission, the candidates should have a Diploma in Engineering/Technology in the relevant branch of specialization awarded by the State Board of Technical Education, Tamil Nadu or any other authority

accepted by the Board of Management of the University as equivalent thereto and a minimum of one year practical experience.

2.3 The selected candidates will be admitted to the B.Tech. programme after he/she fulfills all the admission requirements set by the Institute and after the payment of the prescribed fees.

2.4 In all matters relating to admission to the B.E. / B.Tech. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

2.5 If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute, the Institute may revoke the admission of the candidate with information to the Academic Council.

3. Structure of the programme

3.1 The programme of instruction will have the following structure:

i) A general (common) core programme comprising basic sciences, engineering sciences, humanities, technical arts and mathematics.

ii) An engineering core programme introducing the student to the foundations of engineering in the respective branch.

iii) An elective programme enabling the student to opt and undergo a set of courses of interest to him/ her.

iv) Professional practice including project, seminar and industrial training.

v) General elective courses, such as, Environmental Studies, Physical Education, Professional ethics, and National Service Scheme.

The distribution of total credits required for the degree programme into the above five categories will nominally be 20%, 50%, 15%, 5%, and 10% respectively.

3.2 (i) Full-Time:

The duration of the programme will be a minimum of 8 semesters. Every branch of the B.E. / B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

ii) Part - Time:

The duration of the programme will be a minimum of 7 semesters. Every branch of the B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council

3.3 The academic programmes of the Institute follow the credit system. The general pattern is:

- One credit for each lecture hour per week per semester;
- One credit for each tutorial hour per week per semester;
- Two credits for each laboratory practical/ drawing of three hours per week per semester.
- One credit for 4 weeks of industrial training and
- One credit for 4 hours of project per week per semester

3.4 (i) Full-Time:

For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum

of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 190-200.

(ii) Part-Time:

For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 110-120.

3.5 The medium of instruction, examination and the language of the project reports will be English.

4. Faculty Advisor

4.1 To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

5. Class Committee

5.1 A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

(i) A Chairman, who is not teaching the class.

(ii) All subject teachers of the class.

(iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than three times during a semester.

The functions of the Class Committee will include:

(i) Addressing problems experienced by students in the classroom and the laboratories.

(ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.

(iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

6. Grading

6.1 A grading system as below will be adhered to.

Range of Marks	Letter Grade	Grade points
95 -100	S	10
85 - 94	A	09
75 - 84	B	08
65 -74	C	07
55 - 64	D	06
50 - 54	E	05
< 50	U	00
	I (Incomplete)	–

6.2 GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits Ci of course "i " and the grade points Pi earned for that course taken over all courses "i" registered by the student to the sum of Ci for all "i ". That is,

$$GPA = \frac{\sum_i C_i P_i}{\sum_i C_i}$$

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

6.3 For the students with letter grade I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice-Chancellor of the University. The final marks will be graded using an absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

7. Registration and Enrolment

7.1 Except for the first semester, registration and enrollment will be done in the beginning of the semester as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel and Library up to the end of the previous semester and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

7.3 Students are required to submit registration form duly filled in.

8. Registration requirement

8.1 (i) Full -Time:

A full time student shall not register for less than 16 credits or more than 30 credits in any given semester.

(ii) Part -Time:

A part time student shall not register for less than 10 credits or more than 20 credits in any given semester

8.2 If a student finds his/her load heavy in any semester, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the semester with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any semester should enable him/her to earn the minimum number of credits per semester for the completed semesters.

9. Continuation of the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, a warning letter to the concerned student and also to his/her parents regarding the shortage of his/her credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

10.1 (i) Full - Time

The normal duration of the programme is eight semesters. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 14 semesters excluding the semesters withdrawn on medical grounds or other valid reasons.

(ii) Part - Time

The normal duration of the programme is seven semesters. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 12 semesters excluding the semesters withdrawn on medical grounds or other valid reasons

11. Temporary discontinuation

11.1 A student may be permitted by the Director (Academic) to discontinue temporarily from the programme for a semester or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of two semesters.

12. Discipline

12.1 Every student is required to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

12.2 Any act of indiscipline of a student reported to the Director (Academic) will be referred to a Discipline Committee so constituted. The Committee will enquire into the charges and decide on a suitable punishment if the charges are substantiated. The committee will also authorize the Director (Academic) to recommend to the Vice-Chancellor the implementation of the decision. The student concerned may appeal to the Vice-Chancellor whose decision will be final. The Director (Academic) will report the action taken at the next meeting of the Council.

12.3 Ragging and harassment of women are strictly prohibited in the University campus and hostels.

13. Attendance

13.1 A student whose attendance is less than 75% in a semester is not eligible to appear for the end-semester examination for that semester. The details of all students who have less than 75% attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and Director (Academic).

13.2 Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However, a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Director (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS

events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer - in-charge. All such applications should be recommended by the concerned HOD and forwarded to Director (Academic) within seven instructional days after the programme / activity.

14. Assessment Procedure

14.1 The Academic Council will decide from time to time the system of tests and examinations in each subject in each semester.

14.2 For each theory course, the assessment will be done on a continuous basis as follows:

Test / Exam	Weightage	Duration of Test / Exam
First Periodical Test *	10%	2 Periods
Second Periodical Test *	10%	2 Periods
Model Exam	20%	3 hours
Seminar/Assignments/Quiz	10%	-
Attendance	10%	
End - semester examination	50%	3 Hours

*Best out of the two tests will be considered.

14.3 For practical courses, the assessment will be done by the subject teachers as below:

(i) Weekly assignment/Observation note book / lab records - weightage 60%.

(ii) End semester examination of 3 hours duration including viva - weightage 40%.

14.4 For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

15. Make up Examination/Model Exam

15.1 Students who miss the end-semester examinations / model examination for valid reasons are eligible for make-up examination /model examination. Those who miss the end-semester examination / model examination should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

15.2 Permission to appear for make-up examination / model examination will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / model exam and the same should be duly endorsed by parent / guardian and also by a medical officer of the University within 5 days.

16. Project evaluation

16.1 For Project work, the assessment will be done on a continuous basis as follows:

Review / Examination	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End-semester Examination	50%

For end-semester examination, the student will submit a Project Report in a format specified by the Director (Academic). The first three reviews will be conducted by a Committee constituted by the Head of the

Department. The end-semester examination will be conducted by a Committee constituted by the Registrar / Controller of examination. This will include an external expert.

17. Declaration of results

17.1 A candidate who secures not less than 50% of total marks prescribed for a course with a minimum of 50% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

(ii) To be Eligible to appear for the end semester examinations for a particular course, a candidate will have to secure a minimum of 40% marks in the sessional for that course.

(iii) Candidates are required to obtain all credits assigned to the first two semesters of the programme within the first four semesters of the programme. Candidates failing to satisfy this requirement will not be allowed to proceed to the fifth semester until the condition is satisfied. Further, candidates will not be allowed to proceed to seventh semester if they have not cleared all the courses assigned during third & fourth semesters.

17.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG programmes constituted by the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination/ Registrar.

17.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end-semester examination, he/she shall register and re-appear for the end-semester examination during the following semester. However, the sessional marks secured by the candidate will be retained for all such attempts.

17.4 If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end-semester examination, and wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and Director(Academic) with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

17.5 A candidate can apply for the revaluation of his/her end-semester examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the Registrar/ Controller of Examinations through the Head of the Department. The Registrar/ Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned

through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

17.6 After ten semesters, the sessional marks of the candidate will not be considered for a pass in a course. A candidate who secures 50% in the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

18. Grade Card

18.1 After results are declared, grade sheet will be issued to each student which will contain the following details:

(i) Program and branch for which the student has enrolled.

(ii) Semester of registration.

(iii) List of courses registered during the semester and the grade scored.

(iv) Semester Grade Point Average (GPA)

(v) Cumulative Grade Point Average (CGPA).

19. Class/Division

19.1 Classification is based on CGPA and is as follows:

CGPA $\geq$ 8.0: **First Class with distinction**

6.5 $\leq$ CGPA < 8.0 : **First Class**

5.0 $\leq$ CGPA < 6.5 : **Second Class.**

19.2 (i) Further, the award of 'First class with distinction' is subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses in his/her first appearance within the minimum duration of the programme.

(ii) The award of 'First Class' is further subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses **within 10 semesters.**

(iii) The period of authorized discontinuation of the programme (vide clause 11.1) will not be counted for the purpose of the above classification.

20. Transfer of credits

20.1. Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

20.2 The Academic Council may also approve admission of lateral entry (who hold a diploma in Engineering/ technology) candidates with advance credit based on the recommendation of the transfer of credits committee on a case to case basis.

21. Eligibility for the award of B.Tech. Degree

21.1. A student will be declared to be eligible for the award of the B.Tech. Degree if he/she has

i) registered and successfully acquired the credits for the core courses;

ii) successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;

iii) has no dues to all sections of the Institute including Hostels, and

iv) has no disciplinary action pending against him/her.

The award of the degree must be recommended by the Academic Council and approved by the Board of Management of the University.

22. Change of Branch

22.1 If the number of students in any branch of B.Tech. class as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said branches can be filled by transferring students from other branches. All such transfers will be allowed on the basis of merit of the students. The decision of the Chancellor shall be final while considering such requests.

22.2 All students who have successfully completed the first semester of the course will be eligible for consideration for change of branch subject to the availability of vacancies.

23. Power to modify

23.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.

HINDUSTAN UNIVERSITY

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES OF THE PROGRAMME:

- To enable the students to gain sound knowledge in Electromagnetic theory, Circuit theory, Electronic Devices, Electronic Circuits and Control Systems.
- To impart fundamental knowledge in construction, operation and applications of electrical drives
- To enable the students to model, design and analyze modern power system.
- To give exposure to the emerging alternative energy sources.
- To enable the students to function as accomplished professionals in electrical engineering field with due emphasis on personality development and communication skills. They should also have the capacity to absorb new techniques and innovate in modern technological environment.

Semester I
(Common to all Branches)

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	EL2101	Technical English	3	0	0	3	3
2.	MA2101	Engineering Mathematics-I	3	1	0	4	4
3.	PH2001/ CY2001	Engineering Physics / Engineering Chemistry *	3	0	0	3	3
4.	ME2101	Engineering Graphics	1	0	3	3	4
5.	CS2101	Computer Programming	3	0	0	3	3
Practical							
6.	CS2131	Computer Programming Laboratory	0	0	3	2	3
7.	GE2131	Engineering Practices Laboratory-I*	0	0	3	2	3
8.	EL2131	Communication Skills Laboratory- I	0	0	3	2	3
9.	PH2031/ CY2031	Physics Laboratory / Chemistry Laboratory *	1	0	3	3	4
		Total				**25**	**30**

*** Depending upon the number of batches, it will be alternated between semesters 1 & 2**

SEMESTER II

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	MA2201	Engineering mathematics -II #	3	1	0	4	4
2.	PH2001/ CY2001	Engineering Physics / Engineering Chemistry * #	3	0	0	3	3
3.	EE2201	Circuit Theory	3	1	0	4	4
4.	EE2202	Electronic Devices	3	0	0	3	3
5.	CY2002	Environmental Science and Engineering	3	0	0	3	3
Practical							
6.	EE2231	Circuit Theory Laboratory	0	0	3	2	2
7.	EL2231	Communication Skills Laboratory-II #	2	0	2	3	4
8.	PH 2031/ CY2031	Physics Laboratory / Chemistry Laboratory* #	1	0	3	3	4
9.	GE2231	Engineering Practice Laboratory-II #	0	0	3	2	3
		Total				**27**	**30**

Note: * Depending upon the number of batches, it will be alternated between semesters 1 & 2

 # Common to all Branches

SEMESTER III

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	MA2301	Engineering Mathematics - III	3	1	0	4	4
2.	EE2301	Electromagnetic Theory	3	1	0	4	4
3.	EE2302	Electrical Machines - I	3	1	0	4	4
4.	EE2303	Electronic Circuits	3	0	0	3	3
5.	EE2304	Measurements and Instrumentation	3	0	0	3	3
Practical							
6.	EE2331	Electrical Machines Laboratory- I	0	0	3	2	3
7.	EE2332	Electronic Devices and Circuits Laboratory	0	0	3	2	3
8.	EE2333	Circuits Simulation Laboratory	0	0	3	2	3
9.	EE2334	Measurement and Instrumentation Laboratory	0	0	3	2	3
		Total				**26**	**30**

SEMESTER IV

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	MA2401	Numerical Methods	3	1	0	4	4
2.	EE2401	Electrical Machines - II	3	1	0	4	4
3.	EE2402	Power Plant Engineering	3	1	0	4	4
4.	EE2403	Control Systems	3	1	0	4	4
5.	EE2404	Digital Logic Circuits	3	1	0	4	4
Practical							
6.	EE2431	Electrical Machines Laboratory- II	0	0	3	2	3
7.	EE2432	Control System Laboratory	0	0	3	2	3
8.	EE2433	Digital Logic Circuits Laboratory	0	0	3	2	3
9.	EE2434	Project Work	0	0	6	2	6
		Total				**28**	**35**

SEMESTER V

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	EC2513	Digital Signal Processing	3	1	0	4	4
2.	EE2501	Power Electronics	3	1	0	4	4
3.	EE2502	Transmission and Distribution	3	1	0	4	4
4.	EE2503	Linear Integrated Circuits	3	0	0	3	3
5.	CS2311	Data Structure and Object Oriented Programming in C++ $	3	0	0	3	3
6.	EC2514	Communication Engineering	3	0	0	3	3
Practical							
7.	EE2531	Linear Integrated Circuits Laboratory	0	0	3	2	3
8.	EE2532	Power Electronics Laboratory	0	0	3	2	3
9.	CS2335	Data Structure and Object Oriented Programming in C++ Laboratory $	0	0	3	2	3
		Total				**27**	**30**

$ Common to ECE

SEMESTER VI

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	EE 2601	Power System Analysis	3	1	0	4	4
2.	EE 2602	Solid State Drives	3	1	0	4	4
3.	EE 2603	High Voltage Engineering	3	0	0	3	3
4.	EE 2604	Microprocessor and Microcontroller	3	1	0	4	4
5.	EE 2605	Design of Electrical Apparatus	3	1	0	4	4
6.	GE 2001	Professional Ethics & Human Values	3	0	0	3	3

Practical							
7.	EE2631	Microprocessor and Microcontroller Laboratory	0	0	3	2	3
8.	EL2431	Communication Skills and Personality Development	0	0	3	2	3
9.	EE2633	Power System Simulation Laboratory- I	0	0	3	2	3
		Total				**28**	**31**

SEMESTER VII

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	EE2701	Protection and Switchgear	3	0	0	3	3
2.	EE2702	Power System Operation and Control	3	1	0	4	4
3.	EE2703	Special Electrical Machines	3	0	0	3	3
4.	MG2001	Principle of Management	3	0	0	3	3
5.	EE2704	Real time Systems	3	0	0	3	3
6.		Elective I	3	0	0	3	3
Practical							
7.	EE2731	Power System Simulation Laboratory II	0	0	3	2	3
8.	EE2732	Electrical Drives and Control Laboratory	0	0	3	2	3
		Total				**23**	**25**

SEMESTER VIII

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1.	EE2801	Electrical Energy Utilization and Conservation	3	1	0	4	4
2.		Elective II	3	0	0	3	3
3.		Elective III	3	0	0	3	3
Practical							
4.	EE2831	Project & Viva-voce	0	0	24	6	24
		Total				**16**	**34**

TOTAL CREDITS = 200

Elective Courses

ELECTIVE - I

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
1.	EE2751	Advanced Control system	3	0	0	3	3
2.	EI2704	Fiber Optics and Laser Instrumentation ~	3	0	0	3	3
3.	EE2752	Neural Network and fuzzy logic control	3	0	0	3	3
4.	EE2753	Renewable Energy Systems	3	0	0	3	3

ELECTIVE - II

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
1.	EE2851	Embedded System Design	3	0	0	3	3
2.	EI2861	Bio-medical Instrumentation	3	0	0	3	3
3.	EE2852	Power Quality	3	0	0	3	3
4.	EE2853	VLSI Design	3	0	0	3	3

ELECTIVE - III

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
1.	MG2002	Total Quality Management	3	0	0	3	3
2.	MG2003	Entrepreneurship Development	3	0	0	3	3
3.	EE2854	Power Systems & Smart Grid	3	0	0	3	3

~ Common to EIE

SEMESTER I

EL 2101 TECHNICAL ENGLISH

3 CREDITS

GOAL

The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their workplace or living space; to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students :

(i) To widen the capacity of the learners to listen to English language at the basic level and understand its meaning.

(ii) To enable learners to communicate in an intelligible English accent and pronunciation.

(iii) To assist the learners in reading and grasping a passage in English.

(iv) To learn the art of writing simple English with correct spelling, grammar and punctuation.

(v) To cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.

OUTCOME

(i) The learners will have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.

(ii) The learners will be able to speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.

(iii) The learners will be able to read, comprehend and answer questions based on literary, scientific and technological texts.

(iv) The learners will be able to write instructions, recommendations, checklists, process-description, letter-writing and report writing.

(v) The learners will have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.

UNIT I LISTENING SKILL **9**

Topics: Listening to the sounds, silent letters & stress in English words & sentences - Listening to conversation & telephonic conversation -- Listening for general meaning & specific information -- Listening for positive & negative comments - Listening to technical topics - Listening to prose & poetry reading -- Listening exercises.

Embedded language learning: Sentence definition -- Spelling & punctuation -- Imperative form - Sequencing of sentences -- Gerunds -- Infinitives -- 'Wh-'questions.

UNIT II SPEAKING SKILL **9**

Topics: Self-introduction - Expressing personal opinion - Dialogue - Conversation - Simple oral interaction -- Speaking on a topic -- Expressing views for & against -- Speaking on personal topics like hobbies, topics of interest, present & past experiences, future plans - Participating in group discussions, role plays, debates, presentations, power-point presentations & job-interviews.

Embedded language learning: Adverbs -Adjectives - Comparative and Numerical adjectives -- Nouns & compound nouns -- Prefixes and suffixes.

UNIT III READING SKILL **9**

Topics: Reading anecdotes, short stories, poems, parts of a novel, notices, message, time tables, advertisements, leaflets, itinerary, content page - Reading pie chart & bar chart -- Skimming and scanning -- Reading for contextual meaning - Scanning for specific information -- Reading newspaper & magazine articles - Critical reading -- Reading-comprehension exercises.

Embedded language learning: Tenses - Active and passive voice -- Impersonal passive -- Words and their function -- Different grammatical forms of the same word.

UNIT IV WRITING SKILL **9**

Topics: Writing emails, notes, messages, memos, notices, agendas, advertisements, leaflets, brochures, instructions, recommendations & checklists -- Writing paragraphs -- Comparisons & contrasts - Process description of Flow charts - Interpretation of Bar charts & Pie charts - Writing the minutes of a meeting -- Report writing -- Industrial accident reports -- Letter-writing -- Letter to the editors - Letter inviting & accepting or declining the invitation - Placing orders - Complaints -- Letter requesting permission for industrial visits or implant training, enclosing an introduction to the educational institution -- Letters of application for a job, enclosing a CV or Resume - Covering letter.

Embedded language learning: Correction of errors - Subject-verb Concord -- Articles - Prepositions - - Direct and indirect speech.

UNIT V THINKING SKILL **9**

Topics: Eliciting & imparting the knowledge of English using thinking blocks - Developing thinking skills along with critical interpretation side by side with the acquisition of English -- Decoding diagrams & pictorial representations into English words, expressions, idioms and proverbs.

Embedded language learning: General vocabulary -- Using expressions of cause and effect -- Comparison & contrast -- If-conditionals -- Expressions of purpose and means.

TOTAL=45

REFERENCES

1. Norman Whitby. Business Benchmark: Pre-Intermediate to Intermediate - BEC Preliminary. New Delhi: Cambridge University Press, 2008 (Latest South Asian edition).
2. Devaki Reddy & Shreesh Chaudhary. Technical English. New Delhi: Macmillan, 2009.
3. Rutherford, Andrea J. Basic Communication Skills for Technology. 2nd edition. New Delhi: Pearson Education, 2010.

MA2101 ENGINEERING MATHEMATICS - I

4 CREDITS

GOAL

To impart comprehensive knowledge in engineering mathematics.

OBJECTIVES

The course should enable the students to:

(i) Find the inverse of the matrix by using Cayley Hamilton Theorem and Diagonalisation of matrix using transformation.

(ii) Understand the Evolutes and Envelope of the curve.

(iii) Learn the solutions of second order linear differential equations of standard types and Legendre's linear differential equation.

(iv) Learn partial differentiations involving two and three variables and expansions of functions using Taylor series.

(v) Learn the expansions of trigonometric, hyperbolic functions and their relations.

OUTCOME

The students should be able to:

(i) Identify Eigen value problems from practical areas and obtain its solutions. Using transformation, diagonalising the matrix would render Eigen values.

(ii) Find out effectively the geometrical aspects of curvature and use mathematical skills in constructing evolutes and envelopes in mechanics and engineering drawing.

(iii) Recognize and model mathematically and solve the differential equations arising in science and engineering.

(iv) Understand and model the practical problems and solve it using maxima and minima as elegant applications of partial differentiation.

(v) Acquire skills using trigonometric, hyperbolic and inverse hyperbolic functions.

UNIT I MATRICES **12**

Review: Basic concepts of matrices-addition, subtraction, multiplication of matrices - adjoint -inverse - solving cubic equations.Characteristic equation - Properties of Eigen values - Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof) - Verification and inverse using Cayley Hamilton theorem. Diagonalisation of matrices - Orthogonal matrices - Quadratic form - Reduction of symmetric matrices to a Canonical form using orthogonal transformation - Nature of quadratic form.

UNIT II DIFFERENTIAL CALCULUS **12**

Review: Basic concepts of differentiation - function of function, product and quotient rules.Methods of differentiation of functions - Cartesian form - Parametric form - Curvature - Radius of curvature - Centre of curvature - Circle of curvature. Evolutes of parabola, circle, ellipse, hyperbola and cycloid - Envelope.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS **12**

Review: Definition, formation and solutions of differential equations.Second order differential equations with constant coefficients - Particular integrals - , eaxCosbx, eaxSinbx. Euler's homogeneous linear differential equations - Legendre's linear differential equation - Variation of parameters.

UNIT IV PARTIAL DIFFERENTIATION **12**

Partial differentiation - differentiation involving two and three variables - Total differentiation -Simple problems. Jacobian - verification of properties of Jacobians - Simple problems. Taylor's series - Maxima and minima of functions of two and three variables.

UNIT V TRIGONOMETRY **12**

Review: Basic results in trigonometry and complex numbers - De Moivre's theorem. Expansions of sinn, cosn, tann where n is a positive integer. Expansions of in terms of sines and cosines of multiples of where m and n are positive integers. Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers - Separation of complex functions into real and imaginary parts - Simple problems.

Note: Questions need not be asked from review part.

TOTAL: 60

TEXT BOOKS

1. Erwin Kreyzig, A Text book of Engineering Mathematics, John Wiley, 1999.
2. Grewal B.S, Higher Engineering Mathematics, Thirty Eighth Editions, Khanna Publisher, Delhi, 2004.
3. Chandrasekaran A, A Text book of Engineering Mathematics I, Dhanam Publications, Chennai, 2010.

REFERENCES

1. Venkataraman M.K, Engineering Mathematics, Volume I, The National Publishing Company, Chennai, 1985.
2. Kandaswamy P, Thilagavathy K and Gunavath K, Engineering Mathematics, Volume I & II, S.Chand and Company, New Delhi, 2005.
3. Bali N.P, Narayana Iyengar. N.Ch., Engineering Mathematics, Laxmi Publications Pvt. Ltd, New Delhi, 2003.
4. Veerarajan T, Engineering Mathematics (for first year), Fourth Edition,Tata McGraw - Hill Publishing Company Limited, New Delhi, 2005.

PH2001 ENGINEERING PHYSICS

3 CREDITS

GOAL

To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students:

(i) To develop strong fundamentals of properties and behavior of the materials

(ii) To enhance theoretical and modern technological aspects in acoustics and ultrasonics.

(iii) To enable the students to correlate the theoretical principles with application oriented study of optics.

(iv) To provide a strong foundation in the understanding of solids and materials testing.

(v) To enrich the knowledge of students in modern engineering materials.

OUTCOME

The students should be able to:

(i) Understand the properties and behavior of materials.

(ii) Acquire fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and ultrasonic.

(iii) Understand the concept, working and application of lasers and fiber optics.

(iv) Know the fundamentals of crystal physics and non destructive testing methods.

(v) Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER **9**

Elasticity - types of moduli of elasticity - Stress-Strain diagram - Young's modulus of elasticity - Rigidity modulus - Bulk modulus - Factors affecting elasticity - twisting couple on a wire - Torsional

pendulum - determination of rigidity modulus of a wire - depression of a cantilever - Young's modulus by cantilever - uniform and non-uniform bending - viscosity - Ostwald's viscometer - comparison of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS 9

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS 9

Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics - Nd-Yag laser - CO2 laser - Semiconductor laser - applications - optical fiber - principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - applications - fiber optic communication system.

UNIT IV CRYSTAL PHYSICS AND NON- DESTRUCTIVE TESTING 9

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number - Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 9

Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis -Properties and applications.

Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High Tc superconductors (qualitative) - uses of superconductors.

TOTAL = 45

TEXT BOOKS:

1. Gaur R.K. and Gupta S.L., "Engineering Physics", 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2010.
2. P.Mani, "Engineering Physics", Vol-I, Dhanam Publications, Chennai 2011.
3. Rajendran V. an Marikani A., "Applied Physics for engineers" , 3rd edition, Tata Mc Graw -Hill publishing company Ltd., New Delhi,2003.

REFERENCES:

1. Uma Mukherji, "Engineering Physics ", Narosa publishing house, New Delhi, 2003.
2. Arumugam M., "Engineering Physics", Anuradha agencies, 2007.
3. Palanisamy P.K., "Engineering Physics", SciTech Publications, Chennai 2007.
4. Arthur Beiser, "Concepts of Modern Physics", Tata Mc Graw -Hill Publications, 2007.
5. P.Charles, Poople and Frank J. Owens, "Introduction to Nanotechnology", Wiley India, 2007.

CY2001 ENGINEERING CHEMISTRY

3 CREDITS

GOAL

To impart basic principles of chemistry for engineers.

OBJECTIVES

(i) To make the students conversant with the basics of Water technology.

(ii) To make the students conversant with the basics of Polymer science.

(iii) To provide knowledge on the requirements and properties of a few important engineering materials.

(iv) To educate the students on the fundamentals of corrosion and its control.

(v) To give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.

(vi) To create an awareness among the present generation about the various conventional energy sources

OUTCOME

(i) The students will gain basic knowledge in water analysis and suitable water treatment method.

(ii) The study of polymer chemistry will give an idea on the type of polymers to be used in engineering applications.

(iii) Exposure of the students to the common engineering materials will create awareness among the students to search for new materials.

(iv) Knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.

(v) Students with good exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.

(vi) A good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY 9

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys - Definition, Examples.

UNIT II ENGINEERING MATERIALS 9

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications.- Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS2 And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives - Classification, Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) - Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS 9

Thermodynamic terminology- First Law of Thermodynamics-Internal energy- enthalpy - heat capacity - work done in isothermal expansion of an ideal gas -problems - second law of thermodynamics - entropy change - phase transformations and entropy change - problems - Work Function & Free Energy Function- Maxwell's Relations-Gibbs Helmholtz equation- van't Hoff Isotherm- van't Hoff Isochore - Problems.

UNIT V FUELS AND ENERGY SOURCES 9

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas -Water Gas - Preparation, Properties and Uses - Batteries - Primary Cells - Leclanche Cell -Secondary Cell - Nickel Cadmium Battery - Fuel Cells - Hydrogen -Oxygen Fuel Cell - Solar Battery - Lead Acid Storage Cell - Nuclear Energy - Light water nuclear power plant.

TOTAL : 45

TEXT BOOKS

1. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003

2. Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry, BSP, 2003.

3. S.Sumathi, Engineering Chemistry, Dhanam Publications, 2008.

4. S.Sumathi and P.S.Raghavan, Engineering Chemistry II, Dhanam Publications, 2008.

REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003

2. A. Gowarikar, Text Book of Polymer Science, 2002

3. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004

4. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co. Jalandar, 2004.

ME2101 ENGINEERING GRAPHICS

3 CREDITS

GOAL

To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

OBJECTIVES

The course should enable the students to:

(i) Understand drawing standards and use of drawing instruments.

(ii) Familiarize first angle projection.

(iii) Practice engineering hand sketching and computer aided drafting

(iv) Familiarize with different type of projections.

(v) Gain basic knowledge in computer aided drafting.

OUTCOME

The students should be able to:

(i) Develop Parametric design and the conventions of formal engineering drawing

(ii) Produce and interpret 2D & 3D drawings

(iii) Communicate a design idea/concept graphically

(iv) Hand sketch pictorial views to Orthographic `1views.

(v) Get a Detailed study of an engineering artifact.

Note: Only first angle projection is to be followed

BASICS OF ENGINEERING GRAPHICS **2**

Importance of graphics Use of drawing instruments - BIS conventions and specifications - drawing sheet sizes, layout and folding - lettering - Dimensioning - Geometrical constructions - Scales. Construction of curves like ellipse, parabola, cycloids and involutes.

UNIT I PROJECTION OF POINTS, LINES AND SURFACES **15**

General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projection - Naming views as per BIS - First angle projection. Projection of points. Projection of straight lines located in first quadrant (using rotating line method only). Projection of plane surfaces like polygonal lamina and circular lamina. Drawing views when the surface of the lamina is inclined to one reference plane.

UNIT II PROJECTION OF SOLIDS **10**

Projections of simple solids like prism, pyramid, cylinder and cone - Drawing views when the axis of the solid is inclined to one reference plane.

UNIT III DEVELOPMENT OF SURFACES **10**

Introduction to sectioning of solids. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT IV ORTHOGRAPHIC PROJECTIONS **10**

Orthographic projections - Conversion of orthographic views from given pictorial views of objects, including dimensioning. Free hand sketching of Orthographic views from Pictorial views.

UNIT V PICTORIAL PROJECTIONS **10**

Isometric projection - Isometric scale - Isometric views of simple solids like prisms, pyramids, cylinders and cones. Introduction to perspective Projections.

COMPUTER AIDED DRAFTING (Demonstration Only) **3**

Introduction to computer aided drafting and dimensioning using appropriate software. 2D drawing commands Zoom, Picture editing commands, Dimensioning, Isometric drawing, Iso-Planes and 3D drafting. Plotting of drawing. Practice includes drawing the projection of lines and solids. Prepare isometric view of simple solids like prisms, pyramids, cylinders and cones.

TOTAL : 60

TEXT BOOKS

1. Jeyapoovan T, "Engineering Drawing and Graphics Using AutoCAD", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.
2. Warren J. Luzadder and Jon. M.Duff, "Fundamentals of Engineering Drawing", Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2003.

REFERENCES

1. Bhatt N.D and Panchal V.M, "Engineering Drawing: Plane and Solid Geometry", Charotar Publishing House, Anand-3001, 2007.

2. Thomas E. French, Charles J.Vierck and Robert J.Foster, " Engineering Drawing and Graphic Technology, McGraw- Hill Book company 13th Edition.1987.

3. Venugopal K., "Engineering Graphics", New Age International (P) Limited, New Delhi, 2008.

CS2101 COMPUTER PROGRAMMING

3 CREDITS

GOAL

To introduce computers and programming and to produce an awareness of the power of computational techniques that are currently used by engineers and scientists and to develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.

OBJECTIVES

The course should enable the students to:

1. Learn the major components of a Computer system.
2. Learn the problem solving techniques.
3. Develop skills in programming using C language.

The student should be able to:

1. Understand the interaction between different components of Computer system and number system.
2. Devise computational strategies for developing applications.
3. Develop applications (Simple to Complex) using C programming language.

UNIT I COMPUTER FUNDAMENTALS **9**

Introduction - Evolution of Computers - Generations of Computer - Classification of Computers - Application of Computers - Components of a Computer System - Hardware - Software - Starting a Computer (Booting) - Number Systems.

UNIT II COMPUTER PROGRMMING AND LANGUAGES **9**

Introduction - Problem-Solving Techniques: Algorithms, Flowchart, Pseudocode - Program Control Structures - Programming Paradigms - Programming languages - Generations of Programming Languages - Language Translators - Features of a Good ProgrammingLanguages.

UNIT III PROGRAMMING WITH C **9**

Introduction to C - The C Declaration - Operators and Expressions - Input and Output in C - Decision Statements - Loop Control Statements.

UNIT IV FUNCTIONS, ARRAYS AND STRINGS **9**

Functions - Storage Class - Arrays - Working with strings and standard functions.

UNIT V POINTERS, STRUCTURES AND UNION **9**

Pointers - Dynamic Memory allocation - Structure and Union - Files.

TOTAL = 45

TEXT BOOK:

1. ITL Education Solution Limited, Ashok Kamthane, "Computer Programming", Pearson Education Inc 2007 (Unit: I to V).

REFERNCES:

1. Byron S. Gottfried, "Programming with C", Second Edition, Tata McGraw Hill 2006.
2. Yashvant Kanetkar, "Let us C", Eighth edition, BPP publication 2007.
3. Stephen G.Kochan, "Programming in C - A Complete introduction to the C programming language", Pearson Education, 2008.
4. T.JeyaPoovan, "Computer Programming Theory and Practice", Vikas Pub, New Delhi.

CS2131 COMPUTER PROGRAMMING LABORATORY

2 CREDITS

GOAL

To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES

The course should enable the students :

(i) To gain knowledge about Microsoft office, Spread Sheet.

(ii) To learn a programming concept in C.

OUTCOME

The student should be able to:

(i) Use MS Word to create document, table, text formatting and Mail merge options.

(ii) Use Excel for small calculations using formula editor, creating different types of charts and including pictures etc,

(iii) Write and execute the C programs for small applications.

LIST OF EXPERIMENTS:

a) Word Processing **12**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.

4. Drawing - flow Chart

b) Spread Sheet **9**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document

c) Programming in C **24**

8. To write a C program to prepare the electricity bill.
9. Functions:

   (a) Call by value (b) Call by reference.
10. To write a C program to print the Fibonacci series for the given number.
11. To write a C program to find the factorial of number using recursion.
12. To write a C program to implement the basic arithmetic operations using Switch Case statement.
13. To write a C program to check whether the given number is an Armstrong number.
14. To write a C program to check whether the given string is a Palindrome.
15. To write a C program to create students details using Structures.
16. To write a C program to demonstrate the Command Line Arguments.
17. To write a C program to implement the Random Access in Files.
18. To write C programs to solve some of the Engineering applications

TOTAL : 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30 STUDENTS

HARDWARE

LAN system with 33 nodes (OR) Standalone PCs - 33 Nos

Printers - 3 Nos

SOFTWARE

OS - Windows / UNIX

Application package - MS office

Software - C language

GE2131 ENGINEERING PRACTICE LABORATORY - I
(common to all branches)

2 CREDITS

GOAL

To provide the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

OBJECTIVES

The course should enable the students to

(i) Relate theory and practice of basic Civil and Mechanical Engineering

(ii) Learn concepts of welding and machining practice

(iii) Learn concepts of plumbing and carpentry practice

OUTCOMES

The students should be able to

(i) Indentify the use of tools, Types of joints used in welding, carpentry and plumbing operations.

(ii) Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices.

(iii) Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.

LIST OF EXPERIMENTS

I. MECHANICALENGINEERING PRACTICE 24

1. Welding

   Arc welding: Butt joints, Tee and lap joints.

2. Basic Machining

   Facing, turning, threading and drilling practices using lathe and drilling operation with vertical drilling machine.

3. Machine assembly practice

   Study of centrifugal pump

4. Study on

   a. Smithy operations - Productions of hexagonal headed bolt.

   b. Foundry operations - Mould preparation for gear and step cone pulley.

II. CIVILENGINEERING 21

1. Basic pipe connection using valves, couplings, unions, reducers, elbows in household fitting.

2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels, wooden furniture.

LIST OF EQUIPMENT AND COMPONENTS

(For a Batch of 30 Students)

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
   (a) Rotary Hammer 2 Nos
   (b) Demolition Hammer 2 Nos
   (c) Circular Saw 2 Nos
   (d) Planer 2 Nos
   (e) Hand Drilling Machine 2 Nos
   (f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

TOTAL : 45

EL2131 COMMUNICATION SKILLS LABORATORY - I

2 CREDITS

GOAL

The goal of the programme is to improve the communication skills of the students especially in English and assist them for their personal development as well

OBJECTIVES

The course should enable the students to :

(i) Extend the ability of the learners to be able to listen to English and comprehend its message.

(ii) Enable the learners to have a functional knowledge of spoken English.

(iii) Assist the learners to read and grasp the meaning of technical and non-technical passages in English.

(iv) Help the learners develop the art of writing without mistakes.

(v) Expand the thinking capability of the learners so that they would learn how to view things from a different angle.

OUTCOME

The students should be able to:

(i) Listen to and evaluate English without difficulty and comprehend its message.

(ii) Developed a functional knowledge of spoken English so as to use it in the institution and at job interviews.

(iii) Read and comprehend the meaning of technical and non-technical passages in English.

(iv) Developed the art of writing so as to put down their thoughts and feelings in words.

(v) Think independently and contribute creative ideas.

UNIT I LISTENING SKILL **9**

Topics: Listening to conversations and interviews of famous personalities in various fields -- Listening practice related to the TV-- Talk shows - News - Educative programmes -- Watching films for critical comments - Listening for specific information - Listening for summarizing information - Listening to monologues for taking notes - Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL **9**

Topics: Self-introduction -- Group discussion - Persuading and negotiating strategies - Practice in dialogues -- Presentations based on short stories / poems -- Speaking on personal thoughts and feelings -- academic topics - News reading - Acting as a compere -- Speaking about case studies on problems and solutions - Extempore speeches.

UNIT III READING SKILL **9**

Topics: Reading anecdotes to predict the content - Reading for interpretation -- Suggested reading -

- Short stories and poems -- Critical reading - Reading for information transfer - Reading newspaper and magazine articles for critical commentary - Reading brochures, advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL **9**

Topics: At the beginning of the semester, the students will be informed of a mini dissertation of 1000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL **9**

Topics: Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms and proverbs - Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading.

TOTAL : 45

REFERENCES

1. Raman, Meenakshi, and Sangeetha Sharma. Technical Communication: English Skills for Engineers. 2nd edition. New Delhi: Oxford University Press, 2010.
2. Riordian, Daniel. Technical Communication. New Delhi. Cengage Learning, 2009

Websites for learning English

1. British: Learn English - British Council (Listen & Watch) - <http://learnenglish. british council.org/>
2. American: Randall's ESL Cyber Listening Lab - <http://www.esl-lab.com/>
3. Intercultural: English Listening Lesson Library Online http://www.elllo.org/

Equipments required

1. Career Lab:1 room
2. 2 Computers as a Server for Labs (with High Configuration)
3. LCD Projectors - 4 Nos
4. Headphones with Mic (i-ball) - 100 Nos
5. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
6. Teacher table, Teacher Chair - 1 + 1
7. Plastic Chairs - 75 Nos

PH2031 PHYSICS LABORATORY

3 CREDITS

OBJECTIVES

The course should enable the students to:

1. Determine the of rigidity modulus of the material of a wire by Torsional Pendulum experiment
2. Find the Young's Modulus of a Non Uniform Bending material .
3. Determination of thermal conductivity of a bad conductor by Lee's disc method
4. Determination of thickness of a thin wire by Air Wedge method
5. Find the Refractive index of a prism by using Spectrometer

OUTCOME

The students should be able to:

1. Determine the rigidity modulus of the material of a wire
2. Determine the Young's Modulus of a Non Uniform Bending material.
3. Determine the thermal conductivity of a bad conductor
4. Determine the thickness of a thin wire
5. Find the Refractive index of a prism using Spectrometer

LIST OF EXPERIMENTS

S.No.	List of Experiments	Batch 2 (30)			Batch 1 (30)		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Torsional Pendulum - Determination of rigidity modulus of the material of a wire.	1	1	3	2	1	3
2	Non Uniform Bending - Determination of Young's Modulus.	3	1	3	4	1	3
3	Viscosity -Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.	5	1	3	6	1	3
4	Lee's Disc - Determination of thermal conductivity of a bad conductor.	7	1	3	8	1	3
5	Air Wedge - Determination of thickness of a thin wire.	9	1	3	10	1	3
6	Spectrometer - Refractive index of a prism.	11	1	3	12	1	3
7	Semiconductor laser - Determination of wavelength of Laser using Grating.	13	1	3	14	1	3
	TOTAL	**7**	**2**	**1**	**7**	**2**	**1**
							56 Periods

LIST OF EQUIPMENTSREQUIRED FOR A BATCH OF 30 STUDENTS

1	Torsional Pendulum(500 gm, wt, 60 cm wire Al-Ni Alloy)	5 nos.
2	Travelling Microscope(X10)	15 nos.
3	Capillary tube(length 10cm, dia 0.05mm)	5 nos.
4	Magnifying lens(X 10)	15 nos.
5	Lee's disc apparatus(std form)	5 nos.
6	Stop watch(+/- 1 s)	5 nos.
7	Meter scale1m length	5 nos.
8	Spectrometer(main scale 360 deg, ver 30")	5 nos.
9	Grating(2500 LPI)	5 nos.

10	Laser (632.8 nm)	5 nos.
11	Semi transparent glass plateAl coating, 65 nm thickness, 50% visibility	5 nos.
12	Equilateral prism (n = 1.54)	5 nos.
13	Thermometer +/- 1 deg	8 nos.
14	Screw gauge (+/- 0.001cm)	12 nos.
15	Vernier caliper (+/- 0.01 cm)	8 nos.
16	Steam Boiler 1 L	5 nos.
17	Scale 50 cms	5 nos.
18	Cylindrical mass 100 gms	10 sets
19	Slotted wt 300 gms	5 sets
20	Heater 1.5 KW	5 nos.
21	Transformer sodium vapour lamp 1 KW	10 nos.
22	Sodium vapour lamp 700 W	5 nos
23	Burette 50 mL	5 nos
24	Beaker 250 mL	5 nos
25	Spirit level	10 nos

TOTAL : 60

REFERENCES:

1. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005.

CY2031 CHEMISTRY LABORATORY

3 CREDITS

GOAL

To impart fundamental knowledge in various chemistry experiments.

OBJECTIVES

The course should enable the students to:

1. Estimate the Commercial soda by acid-base titration
2. Determine the Percentage of nickel in an alloy
3. Determine the Temporary, permanent and total hardness of water by EDTA method
4. Determine the Chloride content in a water sample
5. Do Conductometric Titration of mixture of acids

6. Determine the Degree of polymerization of a polymer by Viscometry

OUTCOME

The students should be able to:

1. Estimate the Commercial soda by acid-base titration
2. Determine the Percentage of nickel in an alloy
3. Determine the Temporary, permanent and total hardness of water by EDTA method
4. Determine the Degree of polymerization of a polymer by Viscometry.

LIST OF EXPERIMENTS

S.No.	List of Experiments (Any Five)	Batch 2 (30)			Batch 1 (30)		
		Week	Periods allotted		Week	Periods allotted	
			L	P		L	P
1	Estimation of Commercial soda by acid-base titration	1	1	3	2	1	3
2	Determination of Percentage of nickel in an alloy	3		3	4		3
3	Determination of Temporary, permanent and total hardness of water by EDTA method	5	1	3	6	1	3
4	Determination of Chloride content in a water sample	7		3	8		3
5	Potentiometric Estimation of iron	9	1	3	10	1	3
6	Conductometric Titration of a strong acid with a strong base	11	1	3	12	1	3
7	Conductometric Titration of mixture of acids.	13	1	3	14	1	3
8	Determination of Degree of polymerization of a polymer by Viscometry	15	1	3	16	1	3
	TOTAL		**6**	**24**		**6**	**24**
						60 Periods	

LIST OF GLASSWARE AND EQUIPMENTS REQUIRED FOR A BATCH OF 30 STUDENTS

1	Burette (50 mL)	30 nos.
2	Pipette (20 mL)	30 nos.
3	Conical Flask (250 mL)	30 nos.
4	Distilled water bottle(1 L)	30 nos.
5	Standard flask (100 mL)	30 nos.
6	Funnel (small)	30 nos.
7	Glass rod 20 cm length	30 nos.
8	Reagent Bottle (250 mL)	30 nos.
9	Reagent Bottle (60 mL)	30 nos.
10	Beaker (100 mL)	30 nos.
11	Oswald Viscometer Glass	30 nos.
12	Measuring Cylinder (25 mL)	30 nos.
13	Digital Conductivity Meter PICO make	8 nos.
14	Conductivity cell (K=1)	12 nos.
15	Digital Potentiometer PICO make	8 nos.
16	Calomel Electrode Glass	12 nos.
17	Platinum Electrode Polypropylene	12 nos.
18	Burette Stands Wooden	30 nos.
19	Pipette stands Wooden	30 nos.
20	Retard stands Metal	30 nos.
21	Porcelain Tiles White	30 nos.
22	Clamps with Boss heads Metal	30 nos.
		TOTAL : 60

References:

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. C. W. Garland, J. W. Nibler, D. P. Shoemaker, ;"Experiments in Physical Chemistry, 8th ed.," McGraw-Hill, New York, 2009.
3. S. Sumathi, Engineering Chemistry Practicals, Dhanam Publications, 2011.

SEMESTER-II

MA2201 ENGINEERING MATHEMATICS -II

4 CREDITS

GOAL

To create the awareness and to impart comprehensive knowledge in engineering mmathematics.

OBJECTIVES

The course should enable the students to:

(i) Understand the evaluation of the double and triple integrals in Cartesian and polar forms.

(ii) Know the basics of Vector calculus.

(iii) Know Cauchy - Riemann equations, Milne - Thomson method and Conformal mapping

(iv) Grasp the concept of Cauchy's integral formula, Cauchy's residue theorem and contour integration.

(v) Know Laplace transform and inverse Laplace transform and their properties.

OUTCOME

The students should be able to:

(i) Find area as double integrals and volume as triple integrals in engineering applications.

(ii) Evaluate the gradient, divergence, curl, line, surface and volume integrals along with the verification of classical theorems involving them.

(iii) Apply analytic functions and their interesting properties in science and engineering.

(iv) Evaluate the basics of complex integration and the concept of contour integration which is important for evaluation of certain integrals encountered in practice.

(v) Have a sound knowledge of Laplace transform and its properties and their applications in solving initial and boundary value problems.

UNIT I MULTIPLE INTEGRALS **12**

Review: Basic concepts of integration - Standard results - Substitution methods - Integration by parts - Simple problems.

Double integrals: Cartesian and polar co-ordinates - Change of variables - simple problems - Area as a double integral. Triple integrals: Cartesian co ordinates - Volume as a triple integral - simple problems.

UNIT II VECTOR CALCULUS **12**

Review: Definition - vector, scalar - basic concepts of vector algebra - dot and cross products-properties.

Gradient, Divergence and Curl - Unit normal vector, Directional derivative - angle between surfaces- Irrotational and solenoidal vector fields. Verification and evaluation of Green's theorem - Gauss

divergence theorem and Stoke's theorem. Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.

UNIT III ANALYTIC FUNCTIONS **12**

Review: Basic results in complex numbers - Cartesian and polar forms - Demoivre's theorem.

Functions of a complex variable - Analytic function - Necessary and sufficient conditions (without proof) - Cauchy - Riemann equations - Properties of analytic function - Harmonic function - Harmonic conjugate - Construction of Analytic functions by Milne - Thomson method. Conformal mapping: w = z + a, az, 1/z and bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Statement and application of Cauchy's integral theorem and Integral formula - Evaluation of integrals using the above theorems - Taylor and Laurent series expansions -Singularities - Classification. Residues - Cauchy's residue theorem (without proof) - Contour integration over unit circle and semicircular contours (excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM **12**

Laplace transform - Conditions of existence - Transform of elementary functions - properties - Transforms of derivatives and integrals - Derivatives and integrals of transforms - Initial and final value theorems - Transforms of unit step function and impulse function - Transform of periodic functions. Inverse Laplace transform - Convolution theorem - Solution of linear ODE of second order with constant coefficients.

TOTAL: 60

Note: Questions need not be asked from review part.

TEXT BOOKS

1. Venkatraman M.K, Mathematics, Volume - II, National Publishing Company, Chennai, 1985.
2. Grewal B.S, Higher Engineering Mathematics, Thirty Eighth Editions, Khanna Publisher, Delhi, 2004.
3. Chandrasekaran A, Engineering Mathematics, Volume - II, Dhanam Publication, 2008.

REFERENCES

1. Kandasamy P, Engineering Mathematics Volume II, S. Chand & Co., New Delhi, 1987.
2. Grewal B.S, Engineering Maths - II, Sultan Chand, New Delhi, 1993.
3. Bali N.P, Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Lakshmi Publications, 2003.

EE2201 CIRCUIT THEORY

4 CREDITS

PREREQUISITE

MA2101 - Engineering Mathematics - I

MA2201 - Engineering Mathematics -II

GOAL

To provide knowledge about the application of mathematical concepts in analyzing circuits .

OBJECTIVES

The course will enable the students to:

(i) Get exposed to the basic laws in circuit analysis

(ii) Acquire adequate knowledge about the network theorems in dc and ac circuits.

(iii) Acquire knowledge about resonance and coupled circuits.

(iv) Get adequate knowledge about laplace transform in transients

(v) Get adequate knowledge about three phase circuits

OUTCOME

The students should be able to:

(i) Apply laplace transform in analyzing the circuits.

(ii) Apply theorem to find voltage,current and power through any element

(iii) Solve competitive technical questions.

(iv) Gain knowledge about the resonance circuits.

(v) Gain knowledge about the design of electrical circuits.

UNIT I BASIC CIRCUIT ANALYSIS **12**

Ohm's Law - Kirchoffs laws - DC and AC Circuits - Resistors in series and parallel circuits - Mesh current and node voltage method of analysis for D.C and A.C. circuits.

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS **12**

Network reduction: voltage and current division, source transformation - star delta conversion. Thevenins and Norton Theorem - Superposition Theorem - Maximum power transfer theorem - Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS **12**

Series and parallel resonance - their frequency response - Quality factor and Bandwidth - Self and mutual inductance - Coefficient of coupling - Tuned circuits - Single tuned circuits.

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS **12**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

UNIT V ANALYSIS OF THREE PHASE CIRCUITS **12**

Three phase balanced / unbalanced voltage sources - analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced - phaser diagram of voltages and currents - power and power factor measurements in three phase circuits.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuits Analysis, Tata McGraw Hill publishers, 6th edition, New Delhi, 2002.
2. Sudhakar A and Shyam Mohan SP, Circuits and Network Analysis and Synthesis, Tata McGraw Hill, 2007.

REFERENCES

1. Paranjothi SR, Electric Circuits Analysis, New Age International Ltd., New Delhi, 2006.
2. Joseph A. Edminister, Mahmood Nahri, Electric circuits, Schaum's Series, Tata McGraw-Hill, New Delhi 2001.
3. Chakrabati A,Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons,New Delhi, 2007.
4. Charles K. Alexander, Mathew N.O. Sadik, Fundamentals of Electric Circuits, Second Edition, McGraw Hill, 2007.

EE2202 ELECTRONIC DEVICES

3 CREDITS

PREREQUISITE

PH2001 - Engineering Physics , CY2001 - Engineering Chemistry

GOAL

To Provide Basic Knowledge About Various Semiconductor Devices and their Applications.

OBJECTIVES

To acquaint the students with construction, theory and characteristics of the following electronic devices

(i) P-N junction diode

(ii) Bipolar transistor

(iii) Field effect transistor

(iv) LED,LCD and other photo electronic devices

(v) Power control/regulator devices

OUTCOME

The students should be able to:

(i) Understand the operation of P-N junction diode and Zener diode

(ii) Understand the operation of BJT and FET, its biasing and input-output characteristics of different configurations

(iii) Understand the principle of photo emissivity, photo conductivity and different photo electronic devices

(iv) Use of P-N diode and BJT in switching applications in designing signal conditioning circuits

(v) Perform laboratory experiments on the mentioned different electronic devices.

UNIT I SEMICONDUCTOR DIODE 9

Theory of p-n junction - p-n junction as diode - p-n diode currents - Volt-amp characteristics - Diode resistance - Temperature effect of p-n junction - Transition and diffusion capacitance of p-n diode - Diode switching times.

UNIT II BI-POLAR TRANSISTOR 9

Junction transistor - Transistor construction - Detailed study of currents in transistor - Input and output characteristics of CE, CB and CC configurations - Transistor hybrid model for CE configuration - Analytical expressions for transistor characteristics - Transistor switching times - Voltage rating - Power transistors.

UNIT III FIELD EFFECT TRANSITORS 9

Junction field effect transistor - Pinch off voltage - JFET volt-ampere characteristics - JFET small signal model - MOSFETS and their characteristics - FET as a variable resistor - Unijunction transistor.

UNIT IV OPTO ELECTRONIC DEVICES 9

Photo emissivity and photo electric theory - Theory, construction and characteristics. Light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

UNIT V MISCELLANEOUS DEVICES 9

Theory, characteristics and application: SCR, TRIAC, PUT, tunnel diode, thermistors, piezo electric devices, zener diode, charge coupled devices, varactor diode and LDR.

L = 45 TOTAL = 45

TEXT BOOKS

1. Jacob. Millman, Christos C.Halkias, Electronic Devices and Circuits, Tata McGraw Hill Publishing Limited, New Delhi, 2003.

2. David A. Bell, Electronic Devices and Circuits, Prentice Hall of India Private Limited, New Delhi, 2003.

REFERENCES

1. Theodre. F. Boghert, Electronic Devices & Circuits, Pearson Education, VI Edition, 2003.

2. Ben G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education, 2002 / PHI

3. Allen Mottershead, Electronic Devices and Circuits - An Introduction, Prentice Hall of India Private Limited, New Delhi, 2003.

CY2002 ENVIRONMENTAL SCIENCE AND ENGINEERING

3 CREDITS

GOAL

To impart basic knowledge on the significance of environmental science for engineers.

OBJECTIVES

The course should enable the students to :

(i) Make the students aware of the existing natural resources such as forest and water resources. To educate them to understand the need for preserving the resources.

(ii) Educate the students about the functions of various ecosystems and biodiversity.

(iii) Provide knowledge on the various aspects of different types of pollution such as air pollution, water pollution, soil pollution etc.

(iv) Give a basic knowledge on the social issues such as global warming, acid rain, ozone layer depletion, nuclear hazards etc. and to educate them about the various Environmental Protection Acts.

(v) To create an awareness among the present generation about the various aspects of human population and their effect on environment.

OUTCOME

The students should be able to:

(i) The students would have understood the effects of over exploitation of water resources, forest resources etc. and their impact on day to day life on earth.

(ii) Knowledge on the functions of several ecosystems will help the students to design the processes that are eco friendly.

(iii) Knowledge on the different types of pollution will help the young minds to device effective control measures to reduce rate of pollution.

(iv) Exposure on the issues such as global warming, acid rain, ozone layer depletion, and nuclear hazards will make the students understand the significances of sustainable development and the need to enforce Environmental Acts.

(v) Educating on the various aspects of population explosion will create awareness on population control for effective utilization of the resources and the need to explore new alternate energy resources for a healthy environment.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance - Need for public awareness - Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources - Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets - river / forest / grassland / hill / mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

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 (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) - Introduction to Biodiversity - Definition: genetic, species and ecosystem diversity - Biogeographical 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-spots 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

Field study of common plants, insects, birds Field study of simple ecosystems - pond, river, hill slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition - Causes, 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 - Soil waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an

individual in prevention of pollution - Pollution case studies - Disaster management: floods, earthquake, cyclone and landslides.

Field Study of local polluted site - Urban / Rural / Industrial / Agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT **7**

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, case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. - Wasteland reclamation - Consumerism and waste products - Environment Production 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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT **6**

Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV / AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case studies.

TOTAL : 45

TEXT BOOKS

1. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co., 1971.
3. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, 1999.
4. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications, 1998.

REFERENCES

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India, 2004.
2. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
4. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

EE2231 CIRCUIT THEORY LABORATORY

2 CREDITS

COREQUISITE

EE2201 - Circuit Theory

GOAL

To provide practical knowledge in Circuit Analysis.

OBJECTIVES

The course should enable the students to :

(i) Basic Circuit laws : ohms and Kirchoff's law

(ii) Thevenin's and Norton's Theorem

(iii) Maximum power transfer and superposition theorem

(iv) Mesh and nodal analysis

(v) Transient and frequency response

(vi) Series and parallel resonance

(vii) Basic inductance circuits

OUTCOME

The students should be able to:

(i) Analyze basic laws in circuit analysis like KCL, KVL and ohms law

(ii) Analyze various network theorems

(iii) Analyze mesh and nodal analysis

(iv) Analyze transient and frequency response

(v) Analyze resonance and inductance circuit

LIST OF EXPERIMENTS

S.No.	List of Experiments	No. of Hours
	Introduction	3
1	Verification of ohm's law and Kirchoff's laws.	3
2	Verification of Thevenin's and Norton's Theorem	6
3	Verification of superposition Theorem	3
4	Verification of maximum power transfer theorem.	3
5	Verification of reciprocity theorem	3
6	Measurement of self inductance of a coil	3

7	Verification of mesh and nodal analysis.	6
8	Transient response of RL and RC circuits for DC input.	3
9	Frequency response of series and parallel resonance circuits.	3
10	Frequency response of single tuned coupled circuits.	3
	Repeat classes	3
	Model Exam	3
		P:45, TOTAL:45

LIST OF EQUIPMENTS

S.No.	EQUIPMENT	QUANTITY
1	Regulated Power Supply	13
2	Function Generator	6
3	CRO	6
4	Bread Board	15 Nos.
5	Voltmeter of different ranges	10 Nos.
6	Milli Ammeter of different ranges	13 Nos.
7	Resistor of various ranges	50 Nos.
8	Inductor of various ranges	10 Nos.
9	Capacitor of various values	5 Nos.
8	SPST	2
9	Autotransformer	2
10	Stop Watch	2
11	Connecting Wires	Sufficient Numbers

EL2231 COMMUNICATION SKILLS LABORATORY II

3 CREDITS

GOAL

The goal of the programme is to provide an advanced practical input towards moulding student-achievers who can use the English language with ease.

OBJECTIVES

The course should enable the students to :

(i) Extend the power of the learners to listen to English at an advanced level and comment on it.

(ii) Guide the learners to speak English at the formal and informal levels.

(iii) Read and grasp the in-depth meaning of technical and non-technical passages in English.

(iv) Help the learners develop the art of writing at the formal and informal levels.

(v) Expand the thinking capability of the learners so that they would learn how to be original in their thoughts.

OUTCOME

(i) The learners will be able to listen to and understand English at an advanced level and interpret its meaning.

(ii) The learners would have developed English at the formal and informal levels and thus gained the confidence to use it without fear.

(iii) The learners will be able to read and grasp the in-depth meaning of technical and non-technical passages in English.

(iv) The learners will have developed the art of formal and informal writing.

(v) The learners will be able to think independently and creatively and also verbalize their thoughts fearlessly.

UNIT I LISTENING SKILL **12**

Listening to telephonic conversations -- Listening to native British speakers -- Listening to native American speakers -- Listening to intercultural communication -- Listening to answer questions as one-liners and paragraphs -- Listening practice to identify ideas, situations and people -- Listening to group discussions -- Listening to films of short duration.

UNIT II SPEAKING SKILL **12**

Interview skills - People skills - Job interview - Body language and communication -- How to develop fluency -- Public speaking -- Speaking exercises involving the use of stress and intonation - Speaking on academic topics - Brain storming & discussion - Speaking about case studies on problems and solutions - Extempore speeches - Debating for and against an issue - Mini presentations - Generating talks and discussions based on audiovisual aids.

UNIT III READING SKILL **12**

Reading exercises for grammatical accuracy and correction of errors -- Reading comprehension exercises with critical and analytical questions based on context - Evaluation of contexts - Reading of memos, letters, notices and minutes for reading editing and proof reading -- Extensive reading of parts of relevant novels after giving the gist of the same.

UNIT IV WRITING SKILL **12**

At the beginning of the semester, the students will be informed of a mini dissertation of 3000 words they need to submit individually on any non-technical topic. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL **12**

Practice in preparing thinking blocks to decode pictorial representations into English words, expressions, idioms and proverbs - Eliciting the knowledge of English using thinking blocks -- Picture rereading -- Finding meaning in the meaningless - Interpreting landscapes, simple modern art and verbal and non-verbal communication.

TOTAL : 60

REFERENCE

1. Ibbotson, Mark. Cambridge English for Engineering. New Delhi: Cambridge University Press, 2009.
2. Smith-Worthington Jefferson. Technical Writing for Success. New Delhi. Cengage Learning, 2007.

WEBSITES

1. British: Learn English - British Council (Business English) - http://learnenglish. britishcouncil. org/.
2. BBC Learning English (General and Business English) - http://www.bbc.co.uk/worldservice/ learningenglish/.
3. Intercultural: English Listening Lesson Library Online http://www.elllo.org/ *

EQUIPMENTS REQUIRED

1. Career Lab:1 room
2. 2 Computers as a Server for Labs (with High Configuration)
3. LCD Projectors - 4 Nos
4. Headphones with Mic (i-ball) - 100 Nos
5. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
6. Teacher table, Teacher Chair - 1 + 1
7. Plastic Chairs - 75 Nos

GE2231 ENGINEERING PRACTICE LABORATORY-II

2 CREDITS

GOAL

To provide knowledge of basic engineering concepts.

OBJECTIVES

The course should enable the students :

(i) To impart knowledge on basic engineering concepts.

OUTCOME

The students should be able to:

(i) To learn how to use Electrical and Electronics tools.

LIST OF EXPERIMENTS

S.No.	LIST OF EXPERIMENTS	No. of Hours
Electrical Engineering:		
1.	Wiring for a tube light.	6
2.	Wiring for a lamp and fan.	6
3.	Staircase wiring	3
4.	Study of (i) Iron box and (ii) Fan with Regulator	6
Electronics Engineering		
5.	Study of Electronic components and Equipments	3
6.	Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.	9
7.	Applications of OP-AMP - Inverter, Adder and Subtractor.	9
8.	Study and verification of Logic Gates	3
		TOTAL : 45

Components Required:

Electrical Engineering

Choke	2 nos
Starter	2 nos
Tubelight stand	2 nos
36W tubelight	2 nos
Fan	2nos

40W lamp	5nos
Single way switch	10 nos
Two way switch	5 nos
Iron box	2nos
Fan with regulator opened (demo purpose)	1no
Connecting Wires as required	

Electronics Engineering

IC Trainer Kit, Resistors, Capacitors, CRO, Function Generator,BreadBoard,Regulated Power Supply, Zener Diode, PN Junction Diode, Potentiometer, Digital Multimeter,Ammeter, Voltmeter, Wattmeter, IC 7408,IC 7432,IC 7486, IC 7400, IC 7404, IC 7402

Text Book

1. T. Jeyapoovan, M.Saravanapandian and S. Pranitha, "Engineering Practices Lab Manual", 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

SEMESTER-III

MA2301 ENGINEERING MATHEMATICS III

4 CREDITS

GOAL

To create the awareness and comprehensive knowledge in engineering mathematics.

OBJECTIVES

The course should enable the students to:

(i) Learn techniques of solving the standard types of first and second partial differential equations.

(ii) Grasp the Fourier series expansions for the given periodic function in the specific intervals and their different forms.

(iii) Learn solving one dimensional wave equation, One and two dimensional heat equation using Fourier series.

(iv) Understand the problems using Fourier transform and learns their properties.

(v) Understand the problems using Z - transform and learns their properties.

OUTCOME

The students should be able to:

(i) Formulate mathematically certain practical problems in terms of partial differential equations, solve them and physically interpret the results.

(ii) Use the knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.

(iii) Formulate and identify certain boundary and initial value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve the vibration and heat flow problems and then interpret the results.

(iv) Apply Fourier transform pair, their properties, with the possible special cases with attention to their applications

(v) Apply the basics of Z - transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z - transform technique bringing out the elegance of the procedure involved.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

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

UNIT II 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 III 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 IV FOURIER TRANSFORM **12**

Fourier integral theorem (without proof) - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - simple problems.

UNIT V 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.

TOTAL: 60

TEXT BOOKS

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. Chandrasekaran A, A Text book of Engineering Mathematics III, Dhanam Publications, Chennai, 2010.

REFERENCES

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians," MacMillan, New York, 1988
2. Narayanan, S., Manikavasagom Pillai, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002
3. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
4. Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.

EE2301 ELECTROMAGNETIC THEORY

4 CREDITS

PREREQUISITE

EE2201 - Circuit Theory,
MA2201 - Engineering Maths - II

GOAL

To provide knowledge about the application of mathematical concepts in electromagnetic fields and waves.

OBJECTIVES

The course will enable the students to:

(i) Understand the concepts of vectors,curl and divergence

(ii) Acquire adequate knowledge about the electric potential and the electric field intensity

(iii) Acquire knowledge about the magnetic potential and the magnetic field intensity

(iv) Get adequate knowledge about Maxwell's equation

(v) Get adequate knowledge about waves through different media

OUTCOME

The students should be able to:

(i) Apply vectors in analyzing the electromagnetic fields

(ii) Understand the various aspects of electrostatics.

(iii) Understand the various aspects of magnetostatics

(iv) Gain knowledge about Electrodynamic fields.

(v) Gain knowledge in wave propagation in different media

UNIT I INTRODUCTION **8**

Sources and effects of electromagnetic fields - Vector fields - Different co-ordinate systems - Divergence theorem - Stoke's theorem.

UNIT II ELECTROSTATICS **10**

Coulomb's Law - Electric field intensity - Field due to point and continuous charges - Gauss's law and application - Electrical potential - Electric field and equipotential plots - Electric field in free space, conductors, dielectric - Dielectric polarization, Electric field in multiple dielectrics - boundary conditions, Poisson's and Laplace's equations - Capacitance-energy density - Dielectric strength.

UNIT III MAGNETOSTATICS **9**

Lorentz Law of force, magnetic field intensity - Biot-savart Law - Ampere's Law - Magnetic field due to straight conductors, circular loop, infinite sheet of current - Magnetic flux density (B) - B in free space, conductor, magnetic materials - Magnetization - Magnetic field in multiple media - Boundary

conditions - Scalar and vector potential - Magnetic force - Torque - Inductance - Energy density - Magnetic circuits.

UNIT IV ELECTRODYNAMIC FIELDS **9**

Faraday's laws, induced emf - Transformer and motional EMF, Maxwell's equations (differential and integral forms) - Displacement current - Relation between field theory and circuit theory.

UNIT V ELECTROMAGNETIC WAVES **9**

Generation - Electro Magnetic Wave equations - Wave parameters; velocity, intrinsic impedance, propagation constant - Waves in free space, lossy and lossless dielectrics, conductors-skin depth, Poynting vector - Plane wave reflection and refraction.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. Sadiku, "Elements of Electromagnetics", Fifth edition, Oxford University Press, 2009.
2. William .H.Hayt, "Engineering Electromagnetics", Tata McGraw Hill edition, 2010.
3. John.D.Kraus, "Electromagnetics", McGraw Hill book Co., New York, Fourth Edition, 1991.

REFERENCES

1. Joseph. A.Edminister, "Theory and Problems of Electromagnetics", Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. I.J. Nagrath, D.P. Kothari, "Electric Machines", Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
3. Kraus and Fleish, "Electromagnetics with Applications", McGraw Hill International Editions, Fifth Edition, 1999.

EE2302 ELECTRICAL MACHINES - I

4 CREDITS

PREREQUISITE

EE2101 - Circuit Theory,

EE2302 - Electromagnetic Theory

GOAL

To expose the students to the concepts of various types of DC Machines and Transformers.

OBJECTIVES

The course will enable the students to understand:

(i) Electro-mechanical energy conversions in D.C. machines and energy transfer in transformers

(ii) Constructional details, principle of operation, characteristics and performance of D.C. generator.

(iii) Constructional details, principle of operation, characteristics and speed control of D.C. motors.

(iv) Constructional details and principle of operation and performance of transformer

(v) Testing of D.C. machines and transformer

OUTCOME

The students should be able to:

(i) Various types, Principle of Operation and Characteristics of DC Motors and DC Generators.

(ii) Principle of Operation, types, Characteristics and parallel operation of DC Generators.

(iii) Principle of Operation, types, Characteristics and speed control of DC Motors.

(iv) Construction and Principle of Operation, Testing, Regulation , equivalent circuit of Transformers

(v) Various direct and indirect test methods to find the efficiency of DC machines and transformer.

UNIT I BASIC CONCEPTS OF ROTATING MACHINES 8

Principles of electromechanical energy conversion - Single and multiple excited systems - m.m.f of distributed A.C. windings - Rotating magnetic field - Generated voltage - Torque in round rotor machine.

UNIT II DC GENERATORS 8

Constructional details - emf equation - Methods of excitation - Self and separately excited generators - Characteristics of series, shunt and compound generators - Armature reaction and commutation - Parallel operation of DC shunt and compound generators.

UNIT III DC MOTORS 9

Principle of operation - Back emf and torque equation - Characteristics of series, shunt and compound motors - Starting of DC motors - Types of starters - Speed control of DC series and shunt motors.

UNIT IV TRANSFORMERS **12**

Constructional details of core and shell type transformers - Types of windings - Principle of operation - emf equation - Transformation ratio - Transformer on no-load - Parameters referred to HV / LV windings - Equivalent circuit - Transformer on load - Regulation - Parallel operation of single phase transformers - Auto transformer - Three phase transformers - Vector group.

UNIT V TESTING OF DC MACHINES AND TRANSFORMERS **8**

Losses and efficiency in DC machines and transformers - Condition for maximum efficiency - Testing of DC machines - Brake test, Swinburne's test, Retardation test and Hopkinson's test - Testing of transformers - Polarity test, load test, open circuit and short circuit tests - All day efficiency.

L = 45 T = 15 Total = 60

Note: Unit 5 may be covered along with Unit 2, 3, and 4.

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, Reprint 2008.
2. V.K.Metha & Rohit Metha,'Principle of Electrical Machines', S.Chand Publishers, 2009.

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.

EE2303 ELECTRONIC CIRCUITS

3 CREDITS

PREREQUISITE

EE2202 - Electronic Devices

GOAL

To provide knowledge in the analysis and design of amplifiers and their applications.

OBJECTIVES

The course will enable the students :

(i) To get exposed to the analysis and design of small signal and larger signal amplifiers.

(ii) To make students familiar with common mode and differential mode analysis of differential amplifier.

(iii) Study the characteristics and construction of tuned amplifiers.

(iii) To get exposed to negative feedback amplifiers and oscillators.

(iv) To familiarize the students with the applications such as wave form generation, clippers and clampers etc.,

(v) To get exposed to rectifiers and power supply circuits

OUTCOME

The students should be able to:

(i) Analyze and design small signal and large signal amplifiers.

(ii) Analyze and design Differential amplifiers and to explain the working of tuned amplifiers.

(iii) Explain the different type of negative feedback amplifiers and oscillator circuits with their design equations.

(iv) Enumerate the points on wave form generation, clipper and clamper applications using transistors and diodes.

(v) Explain the operation of Rectifiers and power supply cicuits.

UNIT I SMALL-SIGNAL AND LARGE SIGNAL AMPLIFIERS 9

Fixed and self biasing of BJT & FET - Small signal analysis of CE, CC & Common source amplifiers - Cascade and Darlington connections, transformer coupled class A, B & AB amplifiers - Push-pull amplifiers.

UNIT II DIFFERENTIAL AND TUNED AMPLIFIERS 9

Differential amplifiers - Common mode and differential mode analysis - DC and AC analysis - Characteristics of tuned amplifiers - Single & double tuned amplifier.

UNIT III FEEDBACK AMPLIFIER AND OSCILLATORS 9

Characteristics of negative feedback amplifiers - Voltage / Current, series/shunt feedback - Theory of sinusoidal oscillators - Phase shift and Wien bridge oscillators - Colpitts, Hartley and crystal oscillators.

UNIT IV PULSE CIRCUITS 9

RC wave shaping circuits - Diode clampers and clippers - Multivibrators - Schmitt triggers - UJT based sawtooth oscillators.

UNIT V RECTIFIERS AND POWER SUPPLY CIRCUITS 9

Halfwave & fullwave rectifier analysis - Inductor filter - Capacitor filter - Series voltage regulator - Switched mode power supply.

L= 45 TOTAL = 45

TEXT BOOKS

1. David A. Bell, 'Electronic Devices & Circuits', Prentice Hall of India/Pearson Education, IV Edition, ninth printing, 2007.

2. Jacob Millman & Christos.C.Halkias, Satyabrata Jit, 'Electronic Devices and Circuits ', Tata McGraw Hill, 2nd edition, 2008.

3. Robert. L. Boylestad & Lo Nashelsky, 'Electronic Devices & Circuit Theory', Ninth edition, Pearson Education, 2009 / PHI.

REFERENCES

1. Jacob Millman & Herbert Taub, 'Pulse, Digital & Switching Waveforms', Tata McGraw Hill, Edition 2000, 24th reprint, 2003.

2. Donald L.Schilling and Charles Belove, 'Electronic Circuits', 3rd Edition, Tata McGraw Hill, 2003.

3. Jacob Millman & Christos.C.Halkias, 'Integrated Electronics: Analog and Digital Circuits and System',50th reprint, Tata McGraw Hill, 2009.

EE2304 MEASUREMENTS AND INSTRUMENTATION

3 CREDITS

PREREQUISITE

EE2201 - Circuit Theory
EE2303 - Electronic Circuits

GOAL

To learn how to design accurate meters with high precision and small size.

OBJECTIVES

The course will enable the students :

(i) To get the knowledge of various electrical instruments

(ii) To know how to improve the accuracy of instruments

(iii) To know about the calibration and measurements

(iv) To know about the digital instruments

(v) To know about various types of transducers.

OUTCOME

The students should be able to:

(i) Gain knowledge of various electrical instruments.

(ii) Analyze the accuracy of instruments.

(iii) Analyze various types of AC and DC bridges.

(iv) Know the principle of operation of various types of transducers.

UNIT I INTRODUCTION **9**

Functional elements of an instrument - Static and dynamic characteristics - Errors in measurement

- Statistical evaluation of measurement data - Standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and types of analog and digital voltmeters, ammeters, multimeters - Single and three phase wattmeters and energy meters - Magnetic measurements - Determination of B-H curve and measurements of iron loss - Instrument transformers - Instruments for measurement of frequency and phase both analog and digital

UNIT III MEASUREMENTS USING COMPARISION 9

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape - Recorders,FM recording, PDM recording,digital tape recording, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display.

UNIT V TRANSDUCERS 9

Classification of transducers - Selection of transducers - Resistive, capacitive & inductive transducers - Piezoelectric, optical and digital transducers - LVDT , Thermocouples,Hall effect transducers, Non electrical measurements- Displacement, pressure, strain.

L = 45 TOTAL = 45

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2006.

REFERENCES

1. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1984 edition
2. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd,2009 edition.
3. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, 2010 edition.
4. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 1989 edition.
5. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2010 edition.

EE2331 ELECTRICAL MACHINES LABORATORY-I

2 CREDITS

CO-REQUISITE

EE 2302 - Electrical Machines - I

GOAL

To expose the students to the basic operation in electrical machines and help them to develop experimental skills.

OBJECTIVES

The course should enable the students to :

(i) Study practically DC machines and transformers by direct loading.

(ii) Study practically DC machines and transformers by indirect methods.

OUTCOME

The students should be able to:

(i) Understand the operation of DC machines and Transformers .

(ii) Analyze the performance under varying load conditions.

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
	Introduction	3
1.	Open circuit and load characteristics of separately excited and self excited D.C. generator	6
2.	Load test on D.C. shunt motor	3
3.	Load test on D.C. series motor	3
4.	Speed Control of DC Shunt Motor	3
5.	Swinburne's test and speed control of D.C. shunt motor	3
6.	Load test on single phase transformer and open circuit and short circuit test on single phase transformer	3
7.	Hopkinson's Test	3
8.	Sumpner's test	3
9.	Load test on DC Compound motor	3

10.	Load test on DC compound generator	3
11.	Study of D.C. motor and induction motor starters	3
	Repeat Class	3
	Model Exam	3
		P = 45 TOTAL = 45

LIST OF EQUIPMENT

S.No.	Name of the Equipment	Quantity required
1.	D.Cmotor-Shunt Generator	2set
2.	D.C.Shunt Motor	2Nos.
3.	D.C.Series Motor	1No.
4.	D.C.Compound Motor	1No.
5.	Single phase transformers	7Nos.
6.	Three phase transformers	2Nos.
11.	Resistive load 3 phase-2,single phase-3	5Nos.
13.	Single phase Autotransformer	5Nos.
14.	Three phase Autotransformer	3Nos.
15.	Moving Coil Ammeter of different ranges	20Nos.
16.	Moving Coil Voltmeter of different ranges	20Nos.
17.	Moving Iron Ammeter of different ranges	20Nos.
18.	Moving Iron voltmeter of different ranges	20Nos.
19.	Wire wound rheostats of different ratings	30Nos.
20.	Tachometers	10Nos.
21.	Single element watt -meters of different ranges	20Nos.

EE2332 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

2 CREDITS

PREREQUISITE / CO REQUISITE

EE2202 - Electronic Devices

EE2303 - Electronic Circuits

GOAL

To expose the students to study the characteristics and to determine the device parameters of various solid-state devices.

OBJECTIVES

The course should enable the students to :

(i) Obtain the performance characteristics of various solid state devices.

(ii) Construct and obtain the performance parameters of Oscillator circuits,Rectifier circuits,Amplifier circuits using solid state devices

OUTCOME

The students should be able to:

(i) Understand the performance of various solid state devices.

(ii) Understand the working of Oscillator circuits, Rectifier circuits and Amplifier

List of Experiments

S.No.	Title of Experiments	No. of Hours
1	Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters.	6
2	Static characteristics and parameter determination of JFET.	3
3	Static characteristics of semiconductor diode, zener diode and study of simple voltage regulator circuits.	3
4	Static characteristics of UJT and its application as a relaxation oscillator.	6
5	Photodiode, Phototransistor characteristics and study of light activated relay circuit.	3
6	Static characteristics of Thermistors.	3
7	Single phase half wave and full wave rectifiers with inductive and capacitive filters.	3
8	Phase shift oscillators and Wien bridge oscillators.	6
9	Frequency response of common emitter amplifiers.	3
10	Differential amplifiers using FET.	3

P : 45 TOTAL : 45

S.No	Component	Specification	Quantity
1	Transistor	BC 107/108, BC548, BFW11/10, 2N2646	Each 5
2	Resistor	1k Ω	20
		330 Ω ,470 Ω ,68k Ω	Each 1
		2.2k Ω	2
		100k Ω	3
		56 Ω ,47 Ω	Each 1
		4.7k Ω	8
		6.8k Ω ,27k Ω ,3.3k Ω	Each 1
		5.6k Ω , 47k Ω ,3.9k Ω ,15k Ω	Each 2
		100 Ω	1
3	Potentiometer	10k Ω	1
4	Capacitor	0.1μF	3
		100 μF	2
		0.01 μF	3
		10 μF	4
		2.2 μF	1
		22 μF	2
5	Inductor	100mH	1
6	Diode	IN4001/4007	3
7	Regulated power supply		13
8	Ammeter	(0-15) μA	1
		(0-30) mA	2
		(0-1)mA	2
		(0-500)μA	1
9	Voltmeter	(0-1)V	2
		(0-30)V	7
10	Photodiode		1
11	Phototransistor		1

12	Muffel furnace		1
13	Thermistor		1
14	Soldering Iron		1
15	Thermometer		1
16	Multimeter		5
17	Transformer	(15-0-15) V	1
18	CRO		5
19	Probes		10
20	BreadBoard		10

EE2333 CIRCUITS SIMULATION LABORATORY

2 CREDITS

PREREQUISITE / CO REQUISITE

EE2201 - Circuit Theory
EE2231 - Circuit Theory Laboratory

GOALS

To familiarize the student with the functioning of oscilloscope, function generator, multimeter, frequency counter, and simulators such as Pspice.

OBJECTIVES

The course should enable the students to :

(i) Know how oscilloscope, function generator, multimeter, frequency counter works.

(ii) Verify various theorems and electric circuits using simulators such as pspice.

OUTCOME

The students should be able to:

(i) Understand the functioning of oscilloscope, function generator,multimeter, frequency counter .

(ii) Simulate various electric circuits.

LIST OF EXPERIMENTS

S.No	Title of Experiment	No. of Hours
	Introduction	3
1	DC measurements DC power supply and digital multi meter	3
1	AC measurements oscilloscope, function generator and frequency counter	3
2	Mesh and node equations	3

3	The venin and Norton equivalents	3
4	Superposition theorem	3
5	First-order circuits	3
6	Second order circuits	3
7	Computation of power factor using sinusoidal steady state analysis	6
8	Series and parallel resonance	6
9	Transfer functions	6
	Model exam	3

Total hours : 45

S.No	Description of Equipment	Quantity Required
1.	Regulated Power Supply	5 Nos
2.	Digital Multimeter	5 Nos
3.	CRO	5 Nos
4.	Function Generator	5 Nos
5.	Frequency counter	5 Nos
6.	ComputersPentium 4	30 Nos

S.No.	Description of Software	No.of Users
1.	MATLAB 7.8	5 licensed users
2.	LABVIEW2012	30 licensed users
3.	PSPICE	10 users

EE2334 MEASUREMENTS AND INSTRUMENTATION LABORATORY

2 CREDIT

CO REQUISITE

EE 2304 - Measurements and Instrumentation

GOAL

To familiarize the students with different measuring instruments and digital simulation of linear systems

OBJECTIVES

The course should enable the students to :

(i) Bridges, amplifiers and calibration of current transformers.

(ii) Digital simulation of linear systems

OUTCOME

The students should be able to:

(i) Understand the functioning Bridges, amplifiers and calibration of current transformers.

(ii) Obtain the characteristics of linear systems using digital simulation.

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Introduction Class	3
2	DC Bridges i) Wheastones bridge	3
	ii) kelvin's double bridge	3
3	AC Bridges i) Anderson bridge	3
	ii) schering bridge	3
4	Instrumentation amplifiers	3
5	Study of Transients	3
6	Calibration of 1-phase energy meter	3
7	Calibration of current transformers	3
8	Study of Synchros	3
9	Digital simulation of linear first order for step input Digital simulation of linear second order for step input	3
10	Voltage measurement using LVDT	3
11	Digital simulation of instrumentation amplifier	3
12	Digital simulation of RC transient circuit	3
13	Model lab test	3

P : 45 TOTAL : 45

SEMESTER - IV

MA2401 NUMERICAL METHODS

4 CREDITS

GOAL

To create the awareness and comprehensive knowledge in numerical solutions.

OBJECTIVES

The course should enable the students to:

(i) Learn the techniques of solving the algebraic and transcendental equations.

(ii) Learn to interpolate using Newton's forward and backward difference formulae for equal and unequal intervals

(iii) Understand the use of numerical differentiation and to find the approximate area using numerical integration.

(iv) Understand solving numerically the initial value problems for ordinary differential equations using single step and multi step method.

(v) Learn the methods of solving second order partial differential equations numerically and use it to solve initial and boundary value problems for partial differential equations.

OUTCOME

The students should be able to:

(i) Find out the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations by direct and indirect methods.

(ii) Solve problems where huge amounts of experimental data are involved; the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.

(iii) Use the numerical differentiation and integration when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

(iv) Solve engineering problems which are characterized in the form of nonlinear ordinary differential equations, since many physical laws are couched in terms of rate of change of one independent variable

(v) Solve the initial and boundary value problems related heat flow, one and two dimensional and vibration problems. Understands the numerical techniques of solving the partial differential equation in engineering applications.

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 12

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 algebraic system of equations - Direct methods - Gauss-Jordon method and Crout's method - Iterative method: Gauss-Seidel method.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation - equal intervals - Newton's forward and backward difference formulae - problems. Interpolation-unequal intervals - Newton's divided difference formula - Lagrange's and inverse interpolation-problems.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical differentiation - Newton's forward and backward difference - Divided differences and finite differences - Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules. Two and Three point Gaussian quadrature formulae - Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

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

UNIT V INITIAL AND BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS 12

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

TOTAL: 60

TEXT BOOKS

1. Kandasamy P, Thilagavathy K, Gunavathy K, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Chandrasekaran A. and Beena James, "Numerical Methods", Dhanam publications, Chennai, 2011.

REFERENCES

1. Burden R.L, and Faires T.D, "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Gerald C.F, Wheatley P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
3. Balagurusamy E, "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi.

EE2401 ELECTRICAL MACHINES-II

4 CREDITS

PREREQUISITE

EE2301 - Electromagnetic Theory
EE2302 - Electrical Machines - I

GOAL

To expose the students to the concept of operation of synchronous machines and induction motor.

OBJECTIVES

The course will enable the students to:

(i) Understand the construction and operation of synchronous generator

(ii) Understand the construction and operation and torque equation of synchronous motor.

(iii) Understand the construction and operation of three phase induction motor.

(iv) Understand various types of starters and speed control of three phase induction motor.

(v) Understand the construction and operation of single phase induction motor and the special machines.

OUTCOME

The students should be able to:

(i) Explain the concept of synchronous generator and their performance characteristics.

(ii) Explain the concept of V-curves and power developed.

(iii) Explain the concept, losses and circle diagram of three phase induction motor.

(iv) Explain the concept of starter and speed control of three phase induction motor.

(v) Explain the concept of equivalent circuit and no load and blocked rotor test and special machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details - Types of rotors - emf equation - Synchronous reactance - Armature reaction - Voltage regulation - e.m.f, m.m.f, z.p.f and A.S.A methods - Synchronizing 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 on infinite bus bars - 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 - Sliptorque 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 starting - 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 = 15 TOTAL = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, Reprint 2008.
2. V.K.Metha & Rohit Metha,'Principle of Electrical Machines', S.Chand Publishers, 2009.

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.

EE2402 POWER PLANT ENGINEERING

4 CREDITS

PREREQUISITE

EE2302 - Electrical Machines - I

GOAL

To provide knowledge about various power plant and its operation

OBJECTIVES

The course will enable the students to:

(i) Learn the basics of thermal energy conversion to electrical energy

(ii) Learn the layout and components of hydro electric power plant

(iii) Learn the principle of fission reaction and nuclear power generation

(iv) Learn the basics of gas and diesel power plant

(v) Learn the basics of non conventional power generation

OUTCOME

The students should be able to:

(i) Thermal power plant operation.

(ii) Hydro electric power plant operation

(iii) Principle of nuclear power generation

(iv) Basics of gas and diesel power generation, inter-cooling and various layout

(v) Principle and layout of various non conventional power generation

UNIT I THERMAL POWER PLANTS 12

Basic thermodynamic cycles, various components of steam power plant-layout-pulverized coal burners-Fluidized bed combustion-coal handling systems-ash handling systems- Forced draft and induced draft fans- Boilers-feed pumps-super heater- regenerator-condenser- dearearators-cooling tower

UNIT II HYDRO ELECTRIC POWER PLANTS 12

Layout-dams-selection of water turbines-types-pumped storage hydel plants

UNIT III NUCLEAR POWER PLANTS 9

Principles of nuclear energy- Fission reactions-nuclear reactor-nuclear power plants

UNIT IV GAS AND DIESEL POWER PLANTS 12

Types, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance-reheating, intercoolings, regeneration-advantage and disadvantages- Diesel engine power plant-component and layout

UNIT V NON-CONVENTIONAL POWER GENERATION 15

Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. Arora and Domkundwar , 'A Course in Power Plant Engineering', Dhanpat Rai and Co.Pvt.Ltd., New Delhi.

2. P.K. Nag ,'Power Plant Engineering' , Tata McGraw Hill, Second Edition , Fourth reprint 2003.

REFERENCES

1. Bernhardt G.A.Skrotzki and William A. Vopat ,'Power station Engineering and Economy', Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002.
2. G.D. Rai ,'An introduction to power plant technology', Khanna Publishers, New Delhi-110 005.
3. M.M. El-Wakil , 'Power Plant Technology', McGraw Hill 1984.

EE2403 CONTROL SYSTEMS

4 CREDITS

PREREQUISITE / COREQUISITE

MA2201 - Engineering Maths - II

EE2302 - Electrical Machines - I

EE2401 - Electrical Machines - II

GOAL

To familiarize the students with the basic concepts of linear control theory and design of control system.

OBJECTIVES

The course will enable the students to:

(i) Understand the methods of representation of systems and getting their transfer function models

(ii) Provide adequate knowledge in the time response of systems and steady state error analysis.

(iii) Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.

(iv) Understand the concept of stability of control system and methods of stability analysis.

(v) Study the three ways of designing compensation for a control system

OUTCOME

The students should be able to:

(i) Understand the various methods of representation of systems.

(ii) Apply time response analysis and to determine steady state error.

(iii) Analyse the stability of the system using frequency response plots and able to adjust the gain of the system to satisfy the desired specifications.

(iv) Determine the stability of the sytem by applying various stability criterian.

(v) Design a suitable compensator to stabilize the system and to obtain the desired performance.

UNIT I SYSTEMS AND THEIR 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. Programmable Logic Control- operation.

UNIT II TIME RESPONSE 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 feed back control.

UNIT III FREQUENCY RESPONSE 9

Frequency response - Bode plot - Polar plot - Constant M and N circles - Nichol's chart - Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 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 V COMPENSATOR DESIGN 9

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

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. K. Ogata, "Modern Control Engineering", 5th edition, Pearson Education, New Delhi, 2009 / PHI
2. I.J. Nagrath & M. Gopal, "Control Systems Engineering", New Age International Publishers,2003.

REFERENCES

1. B.C. Kuo, "Automatic Control Systems", Prentice Hall of India Ltd., New Delhi, 1995.
2. M. Gopal, "Control Systems, Principles & Design", Tata McGraw Hill, New Delhi, 2002.
3. M.N. Bandyopadhyay, "Control Engineering Theory and Practice", Prentice Hall of India, 2003.

EE2404 DIGITAL LOGIC CIRCUITS

4 CREDITS

PREREQUISITE

EE2303 - Electronic Circuits

GOAL

To familiarize the students with the basics of number systems, codes, Encoders, Decoders, Multiplexers, DeMultiplexers, Analysis & Design of synchronous & asynchronous sequential circuits and Programmable Logic Devices.

OBJECTIVES

(i) In Number system & Boolean algebra unit the student will be learning about the basics of number systems, codes, Simplification of functions.

(ii) In Combinational circuits unit the student will be learning about logic gates, adders, subtractors, Encoders, Decoders, Multiplexers and DeMultiplexers.

(iii) In Synchronous sequential circuits unit the student will be learning about different types of Flip Flops, Analysis & Design of synchronous sequential circuits and counters.

(iv) In Asynchronous sequenctial circuit unit the student will be learning about Analysis & Design of asynchronous sequential circuits

(v) In programmable logic devices, memory and logic families unit the student will be learning about different types of memories and logical families.

OUTCOME

The students should be able to:

(i) Gain knowledge about code conversions and to simplify any complex circuit.

(ii) Understand about design of adder circuit & subtractor circuit. Also he/she will be able to realize any function using multiplexers.

(iii) Design synchronous sequential circuits and counters.

(iv) Design asynchronous sequential circuits.

(v) Understand different types of memories and logical families.

UNIT I NUMBER SYSTEM & BOOLEAN ALGEBRA 11

Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

UNIT II COMBINATIONAL CIRCUITS 11

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 11

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits - Counters, state diagram; state reduction; state assignment.

UNIT IV ASYNCHRONOUS SEQUENCTIAL CIRCUIT 5

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT V PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 7

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. R.P. Jain , 'Modern Digital Electronics' , Tata McGraw-Hill Education, 2003.
3. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 200REFERENCES
4. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
5. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
6. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

EE2431 ELECTRICAL MACHINES LABORATORY-II

2 CREDITS

COREQUISITE

EE 2401 - Electrical Machines II

GOAL

To expose the students to the basic operation in electrical machines and help them to develop experimental skills.

OBJECTIVES

The course will enable the students to:

(i) Obtain regulation of three-phase alternator and three-phase synchronous motor using various methods.

(ii) Obtain the performance characterstics of three- phase and single-phase induction motor.

OUTCOME

The students should be able to:

(i) Understand the regulation of three-phase alternator and three-phase synchronous motor using various methods.

(ii) Understand performance of three- phase and single-phase induction motor

List of Experiments

S.No	Title of Experiments	No. of Hours
	Introduction	3
1.	Regulation of three phase alternator by emf methods	3
2.	Regulation of three phase alternator by mmf methods	3
3.	Regulation of three phase alternator by ZPF methods	3
4.	Regulation of three phase alternator by ASA methods	3
5.	Regulation of three phase salient pole alternator by slip test	3
6.	V and Inverted V curves of Three Phase Synchronous Motor.	3
7.	Load test on three-phase induction motor.	3
8.	No load and blocked rotor test on three-phase induction motor	3
9.	Separation of No-load losses of three-phase induction motor.	3
10.	Load test on single-phase induction motor	3
11.	No load and blocked rotor test on single-phase induction motor	3
	Repeat Class	6
	Model Exam	3
		P:45 TOTAL :45

S.No.	Name of the Equipment	Quantity required
1.	DC shunt motor coupled three phase alternator	2
2.	Synchronous motor	1
3.	Three phase induction motors-	
	Squirrel cage	2
	Slipring	1
4.	DC Shunt motor coupled salient pole three phase alternator	1
5.	Single phase induction motors	2
6.	Air core inductor to do ZPF	1
7.	Starter-	
	Three point Starters	4
	Three phase induction motor starter	4
	Single phase induction motor starter	2

8.	Meters-	
	Voltmeter (MI)	15
	Ammeter (MI)	15
	Voltmeter (MC)	5
	Ammeter (MC)	5
	Wattmeter(LPF)	15
	Wattmeter(UPF)	15
9.	Single phase autotransformer	2
10.	Three phase autotransformer	4
11.	Rheostats of various range	30
12.	DC panel boards (220V)	1
13.	AC panel board	1
14.	Tachometer	12
15.	Lamp set	1
16.	Frequency meter	1

EE2432 CONTROL SYSTEMS LABORATORY

2 CREDITS

COREQUISITE

EE2403 - Control System

GOAL

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems.

OBJECTIVES

The course will enable the students to

(i) Determine the transfer function parameters of AC servomotor.

(ii) Simulate type-0 and type-1 system.

(iii) Simulate linear systems and non-linear systems using digital simulation.

(iv) Design of P, PI and PID controllers.

(v) Learn Stability analysis of linear systems.

OUTCOME

The students should be able to:

(i) Understand the transfer function parameters for any type of system

(ii) Understand and Simulate(Digital and Analog)time response characteristics of type-0 and type-1 system

(iii) Understand and Design linear and nonlinear systems

(iv) Understand the stability Analysis of the linear system using Bode /Root locus and Nyquist plot.

LIST OF EXPERIMENTS

Sl. No.	Title of Experiment	No. of Hours
	Introduction Class	3
1	Determination of transfer function parameters of AC servo motor	3
2	Determination of transfer function parameters of DC motor	6
3	Analog simulation of Type-0 and Type-1 system	3
4	Digital simulation of Linear system	3
5	Digital simulation of Non-Linear system	3
6	Design and implementation of Compensators	3
7	Stability analysis of linear systems using Routh-Hurwitz and Root Locus method	3
8	Stability analysis of linear systems using Bode plot and Nyquist plot method	3
9	Design of P, PI, PID controllers	3
10	Study of Synchros	3
	Repeat Class	6
	Model Exam	3
		P : 45 Total : 45

LIST OF EQUIPMENTS

Sl. No.	Description	Specification	Quantity
1	AC servo motor	100W	1
2	DC motor	3HP	1
3	Rheostat	1100 Ω , 1.1A, 50 Ω , 5A, 250 Ω , 1.5A	1 Each

4	Ammeter	(0-2)A, (0-5)A, (0-10)A (MC)	2 Each
5	Voltmeter	(0-60)V, (0-300) V (MC&MI)	2 Each
6	Single phase Auto transformer	0-270V, 5A	1
7	RPS	5,15V Combined	4
8	Resisters	1K, 2.7K, 5.6K, 10K, 47K,56K, 68K	20 Each
9	Inductors	Decade Inductance Box	1
10	Capacitors	DCB, 1000μF	1, 5
11	IC 741		10
12	Multimeter		3
13	Computer with MATLAB	Pentium 4	5

EE2433 DIGITAL LOGIC CIRCUITS LABORATORY

2 CREDITS

COREQUISITE

EE2404 - DIGITAL LOGIC CIRCUITS

GOAL

To expose the students to various digital logic circuits used in simple system configuration such as adder, encoder, multiplexer, counters etc.,

OBJECTIVES

The course will enable the students to :

i. Study Basic gates

ii. Implement Boolean Functions

iii. Design Half Adder, Full Adder, Half Subtractor and Full Subtractor circuits.

iv. Design and Implement the following code converters

   a. BCD to XS3 Converter

   b. XS3 to BCD Converter

   c. BINARY to GRAY Converter

   d. GRAY to BINARY Converter

v. Design and Implement 4:1 multiplexer using gates

vi. Design and Implement 1:4 demultiplexer using gates

vii. Design Decoder and Encoder circuits.

viii. Design and implement 3-bit asynchronous and synchronous counters

ix. Design and implement 4-bit shift registers in SISO, SIPO, PISO, PIPO

OUTCOME

The students should be able to:

i. Basic gates

ii. Implementation of any Boolean Functions

iii. Design of Adder and Subtractor

iv. Implementation of different code converters

v. Implementation of 4:1 multiplexer using gates

vi. Implementation of 1:4 demultiplexer using gates

vii. Decoder and Encoder circuits.

viii. Implementation of 3-bit asynchronous and synchronous counters

ix. Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Study of Basic Digital ICs. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND)	3
2	Implementation of Boolean Functions	3
3	Adder/ Subtractor circuits	3+3
4	Code converters a. BCD to XS3 Converter b. XS3 to BCD Converter c. BINARY to GRAY Converter d. GRAY to BINARY Converter	3+3
5	Multiplexer : Design of 4:1 multiplexer using gates. Study of Multiplexer IC.	3
6	Demultiplexer : Design of 1:4 demultiplexer using gates. Study of Demultiplexer IC	3
7	Design of Decoder and Encoder circuits	3+3

8	Study of Basic Flip Flops using gates and ICs. (Verification of truth table for JK Flip Flop, RS F/F, D F/F and TF/F)	3
9	Counters: Design and implementation of 3-bit asynchronous up and down counter using J-K F/F	3
10	Counters: Design and implementation of Mod 5 synchronous counter using J-K F/F	3
11	Shift Registers : Design and implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable ICs	3+3
		P : 45 Total : 45

COMPONENTS REQUIRED

Sl. No.	Description	Quantity
1	Digital IC Trainer Kit	12
2	IC 7408, 7432, 7404, 7400,7402, 7486	20
3	IC 7411, 7410	10
4	IC 74153, 74139	5
5	IC 7474, 7473	10

EE2434 PROJECT WORK

0 0 6 2 6

GOAL

To provide an opportunity to the students to implement the principles of engineering learnt by them in practical applications with innovative ideas and thus enable them to have a practical expos

EVALUATION PROCEDURE

Review	Requirement	Weightage in Internal	Weightage in External	Duration
Zeroth Review	Title selection	-		At the end of 2 week from the start of semester
First Review	Literature review, Proposal for the project	10 %		At the end of 5 week from the start of semester

Second Review	Mathematical Analysis and Circuit Working	20 %		At the end of 8 week from the start of semester
Model Review	Final simulation / Hardware presentation	20%		At the end of 11 week from the start of semester
University Exam	Final Demo		50%	At the end of 12 week from the start of semester

SEMESTER- V

EC2513 DIGITAL SIGNAL PROCESSING

4 CREDITS

PREREQUISITE

EE2201 - Circuit Theory

EE2404 - Digital Logic Circuits

MA2301 - Engineering Maths - III

GOAL

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

OBJECTIVES

The course will enable the students to :

(i) Classify signals and systems & their mathematical representation.

(ii) Analyse the discrete time systems.

(iii) Study various transformation tech-niques & their computation.

(iv) Study about filters and their design for digital implementation.

(v) Study about a programmable digital signal processor & quantization effects.

OUTCOME

The students should be able to:

(i) Signals and systems & their mathematical representation.

(ii) Z-transform, inverse z-transform, stability analysis

(iii) DFT, FFT, DIT and DIF

(iv) Various digital filter design

(v) Programmable digital signal processor

UNIT I INTRODUCTION **9**

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation, analog to digital conversion.

UNIT II DISCRETE TIME SYSTEM ANALYSIS **9**

Z-transform and its properties, inverse z-transforms; difference equation - Solution by z-transform, application to discrete systems - Stability analysis, frequency response - Convolution - Fourier transform of discrete sequence - Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

DFT properties, magnitude and phase representation - Computation of DFT using FFT algorithm - DIT & DIF - FFT using radix 2 - Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization - Parallel & cascade forms. FIR design: Windowing Techniques - Need and choice of windows - Linear phase characteristics.

IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation - Warping, prewarping - Frequency transformation.

UNIT V PROGRAMMABLE DSP CHIPS 9

Architecture and features of TMS 320C54 signal processing chip - Quantisation effects in designing digital filters.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing - A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete - Time Signal Processing', Pearson Education, New Delhi, 2003.
2. B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', Tata McGraw Hill, New Delhi, 2003.
4. Texas TMS 320C54X user manual (website).

EE2501 POWER ELECTRONICS

4 CREDITS

PREREQUISITE

EE2202 - Electronic Devices

EE2303 - Electronic Circuits

EE2302 - Electrical Machines - I

EE2401 - Electrical Machines - II

MA2301 - Engineering Maths - III

GOAL

To introduce the application of electronic devices for conversion, control and conditioning of electric power.

OBJECTIVES

The course will enable the students to:

(i) Get an overview of different types of power semiconductor devices and their switching characteristics.

(ii) Understand the operation, characteristics and performance parameters of controlled rectifiers.

(iii) Study the operation, switching techniques and basic topologies of DC-DC switching regulators.

(iv) Learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction techniques.

(v) Study the simple applications.

OUTCOME

The students should be able to:

(i) Analyse the dynamic and switching characteristics of power semiconductor devices.

(ii) Determine the performance parameters of controlled rectifiers and AC voltage controller.

(iii) Design Choppers and Switching Regulators.

(iv) Understand Fixed DC to Variable AC converters, Various Modulation Techniques employed in Inverters and the Effect of Harmonics.

(v) Apply Power Converters in a Power System such as HVDC Transmission and FACTS.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Structure, operation and characteristics of SCR, TRIAC, power transistor, MOSFET and IGBT.Driver and snubber circuits for MOSFET - Turn-on and turn-off characteristics and switching losses.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulse converters - Inverter operation of fully controlled converter - Effect of

source inductance - Distortion and displacement factor - Ripple factor - Single phase AC voltage controllers.

UNIT III DC TO DC CONVERTERS **9**

Step-down and step-up choppers - Time ratio control and current limit control - Switching mode regulators: Buck, boost, buck-boost and cuk converter - Resonant switching based SMPS.

UNIT IV INVERTERS **9**

Single phase and three phase (both 120degree mode and 180 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM and multiple PWM - Voltage and harmonic control - Series resonant inverter - Current source inverters.

UNIT V APPLICATIONS **9**

Uninterrupted power supply topologies - Flexible AC transmission systems - Shunt and series static VAR compensator - Unified power flow controller- HVDC Transmission.

L = 45 T=15 TOTAL = 60

TEXT BOOKS :

1. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, Third edition, 2004 / PHI.
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and sons, third edition, 2003.

REFERENCES

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third edition, 1993.
2. Bimal K. Bose, "Modern Power Electronics and AC Drives", Pearson Education, 2003.
3. Mr. Jaganathan, "Introduction to Power Electronics", Prentice Hall of India, 2004.

EE2502 TRANSMISSION AND DISTRIBUTION

4 CREDITS

PREREQUISITE

EE2301 - Electromagnetic Theory

EE2201 - Circuit Theory

EE2302 - Electrical Machines - I

EE2302 - Electrical Machines - II

GOAL

The optimal goal of the course is to describe the journey of electricity from the power plant to customers.

OBJECTIVES

The course will enable the students

(i) To gain knowledge of how transmission and distribution systems deliver power from a power plant to customers.

(ii) To identify the basic components of a transmission and distribution system and explain their functions.

(iii) To gain knowledge of how power grids help in continuous flow of power to customers

(iv) To model the transmission line with compensators.

(v) To Design Proper grounding and insulation coordination of transmission line.

OUTCOME

The students should be able to:

(i) Calculate the technical losses due to energy dissipated in the conductors and equipment used for transmission

(ii) Do load management and Energy audits.

(iii) Know the advantages and application of grounding system in the power system.

(iv) Gain knowledge about substation and distribution system.

(v) Establish the types of distribution system.

UNIT I INTRODUCTION **12**

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 12

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 neighbouring 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 12

Classification of lines: Short line, medium line and long line; 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 12

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

UNIT V SUBSTATION,GROUNDING AND DISTRIBUTION SYSTEM 12

Types of substations; bus-bar arrangements; substation bus schemes: single bus scheme, double bus with double breaker and single breaker, main and transfer bus, ring bus, double bus-bar with bypass isolators.Resistance of grounding systems: Resistance of driven rods, resistance of grounding point electrode, grounding grids; design principles of substation grounding system; neutral grounding.Radial and ring-main distributors; interconnectors; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

L=45 T = 15 TOTAL =60

TEXT BOOKS

1. V. K. Mehta & Rohit Mehta Principles of Power System,S.Chand fourth edition, 2008
2. B.R.Gupta, 'Power System Analysis and Design', S.Chand, New Delhi, 2008.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
4. S.L.Uppal 'Electrical power' khanna publishers,edition 8th , 2003

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', 2007.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'Tamil Nadu Electricity Board Handbook', 2003.

EE2503 LINEAR INTEGRATED CIRCUITS

3 CREDITS

PREREQUISITE

EE2303 - Electronic Circuits

GOAL

To provide knowledge about the applications of op amp and Special ICs.

OBJECTIVES

The course will enable the students:

(i) To study the IC fabrication.

(ii) To study characteristics; of op-Amp ICs.

(iii) To study the applications of Op-amp.

(iv) To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, Opto-electronic ICs.

OUTCOME

The students should be able to:

(i) Understand IC fabrication

(ii) Understand DC and AC characteristics analysis of different Linear Op-Amp ICs.

(iii) Understand various applications of Op-amp

(iv) Gain knowledge about IC Timers, PLL circuits and Regulator circuits

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging.

UNIT II CHARACTERISTICS OF OP-AMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp - summer, differentiator and integrator.

UNIT III APPLICATIONS OF OP-AMP 9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT IV SPECIAL ICs 9

555 Timer circuit - Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase locked loop-circuit functioning and applications, Analog multiplier ICs.

UNIT V APPLICATION ICs **9**

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

L = 45 TOTAL = 45

TEXT BOOKS

1. D. Roy Choudhury & Shail B. Jain, 'Linear Integrated Circuits', New Age International Publishers, Fourth Edition, 2010.
2. Ramakant A. Gayakwad, 'Op-Amps and Linear Integrated Circuits', Prentice Hall of India, Fourth Edition, 2009.

REFERENCES

1. S. P. Bali , 'Linear Integrated Circuits', Tata Mcgraw Hill Publishers, First Edition, 2008.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Prentice Hall of India, 6th edition, 2009.

CS2311 DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++

3 CREDITS

GOAL

To provide a knowledge in data structures and Object oriented programming.

OBJECTIVES

The course should enable the student :

(i) To learn the systematic way of solving problems.

(ii) To understand the different methods of organizing large amounts of data.

(iii) To efficiently implement the different data structures.

(iv) To efficiently implement solutions for specific problems

(v) To give an In depth Knowledge in object oriented Programming

OUTCOME

The students should be able to:

(i) Have gained knowledge in problem solving techniques.

(ii) Be capable of writing programs using list, stack and queue.

(iii) Have obtained confidence in storing data in tree and other related data structures.

(iv) Have grasped knowledge in various sorting techniques.

(v) Have learnt the concepts in Inheritance, Abstract classes and virtual functions

UNIT I LISTS, STACKS AND QUEUES **9**

Abstract Data Type (ADT) - The List ADT - The Stack ADT - The Queue ADT

UNIT II TREES AND SORTING **9**

Preliminaries - Binary Trees - The Search Tree ADT - Binary Search Trees - AVL Trees - Tree Traversals - Binary Heap- Insertion Sort - Shellsort - Heapsort - Mergesort - Quicksort

UNIT III GRAPHS **9**

Definitions - Topological Sort - Shortest-Path Algorithms - Unweighted Shortest Paths - Dijkstra's Algorithm - Minimum Spanning Tree - Prim's Algorithm - Applications of Depth-First Search - Undirected Graphs - Biconnectivity

UNIT IV OBJECT ORIENTED PROGRAMMING AND C++ **9**

Basic concepts of object oriented programming - Benefits of OOP - Applications of OOP - Basics of C++ - Data types-Operators-Statements-Functions-Classes and Objects - Constructors -Destructors - Overloading

UNIT V INHERITANCE,ABSTRACT CLASSES,VIRTUAL FUNCTIONS **9**

Defining derived classes - Single inheritance - Multilevel inheritance - Multiple inheritance - Hierarchical inheritance - Hybrid inheritance - Virtual base classes - Abstract classes-Virtual functions

TOTAL : 45

TEXT BOOKS

1. M. A. Weiss, "Data Structures and Algorithm Analysis in C++", 3rd ed, Pearson Education Asia, 2009.
2. Bjarne Stroustrup, 'The C++ Programming Language', 3rd edition,Addison Wesley

REFERENCES

1. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C++", Pearson Education Asia, 2009
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures - A Pseudocode Approach with C++", Thomson Brooks / COLE, 2009.
3. Herbert Schildt, 'C++ - The Complete Reference', 4th edition,Tata McGraw Hill.

EC2514 COMMUNICATION ENGINEERING

3 CREDITS

PREREQUISITE

EE2202 - Electronic Devices

EE2303 - Electronic Circuits

GOAL

To introduce the concepts of communication systems engineering using wire and wireless medium

OBJECTIVES

The course will enable the students to:

(i) Introduce different methods of analog communication and their significance

(ii) Introduce Digital Communication methods for high bit rate transmission

(iii) Introduce the concepts of source and line coding techniques

(iv) Introduce MAC used in communication systems for enhancing the number of users.

(v) Introduce various media for digital communication

OUTCOME

The students should be able to:

(i) Understand the different methods of analog communication and their significance

(ii) Understand Digital Communication methods for high bit rate transmission

(iii) Understand the concepts of source and line coding techniques

(iv) Understand various multiple access technology like SDMA, FDMA, TDMA and CDMA

(v) Understand the basics of various media for digital communication

UNIT I ANALOG COMMUNICATION 9

AM - Frequency spectrum - vector representation - power relations - generation of AM - DSB,DSB/SC, SSB, VSB AM Transmitter & Receiver; FM and PM - frequency spectrum - power relations : NBFM & WBFM, Generation of FM and DM, Amstrong method & Reactance modulations :FM & PM frequency.

UNIT II DIGITAL COMMUNICATION 9

Pulse modulations - concepts of sampling and sampling theormes, PAM, PWM, PPM, PTM, quantization and coding : DCM, DM, slope overload error. ADM, DPCM, OOK systems - ASK, FSK,PSK, BSK, QPSK, QAM, MSK, GMSK, applications of Data communication.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL (Qualitative only) 9

Primary communication - entropy, properties, BSC, BEC, source coding : Shaum, Fao, Huffman coding : noiseless coding theorum, BW - SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnB

codes : Efficiency of transmissions, error control codes and applications: convolutions & block codes.

UNIT IV MULTIPLE ACCESS TECHNIQUES **9**

SS&MA techniques : FDMA, TDMA, CDMA, SDMA application in wire and wireless communication : Advantages (merits)

UNIT V SATELLITE, OPTICAL FIBER - POWERLINE, SCADA **9**

Orbits : types of satellites : frequency used link establishment, MA techniques used in satellite communication, earth station; aperture actuators used in satellite - Intelsat and Insat: fibers - types: sources, detectors used, digital filters, optical link: power line carrier communications: SCADA

TOTAL : 45

TEXT BOOKS

1. Taub & Schiling "Principles of communication systems" Tata McGraw hill 2007
2. J.Das "Principles of digital communication" New Age International, 1986

REFERENCES

1. Kennedy and Davis "Electronic communication systems" Tata McGraw hill, 4th edition, 1993.
2. Sklar "Digital communication fundamentals and applications" Pearson Education,2001
3. Bary le, Memuschmidt, digital Communication, Kluwer Publication, 2004.
4. B.P.Lathi "Modern digital and analog communication systems" Oxford University Press, 1998.

EE2531 LINEAR INTEGRATED CIRCUITS LABORATORY

2 CREDITS

COREQUISITE

EE 2503 - Linear Integrated Circuits

GOAL

To expose the students to study the characteristics and to determine the device parameters of various Integrated Circuits .

OBJECTIVES

The course will enable the students to :

(i) To deseign various IC circuits like Inverting, Non inverting , Differential amplifiers, Integrator , Differentiators Filters,DAC and multivibrators,Schmitt trigger.

(ii) To learn PLL characteristics and use the same as Frequency Multiplier

OUTCOME

The students should be able to:

(i) understand the deseigning of various IC circuits.

(ii) understand PLL characteristics.

LIST OF EXPERIMENTS

S.No.	List of Experiments	No. of Hours
1	Inverting, Non inverting and Differential amplifiers.	3
2	Integrator and Differentiator.	3
3	Active lowpass, Highpass and bandpass filters.	3
4	Clippers and Clampers	3
5	4 bit dac converter	3
6	Op amp comparator applications.	3
7	Astable & Monostable multivibrators and Schmitt Trigger using op-amp.	6
8	Phase shift and Wien bridge oscillators using opamp	6
9	Astable and monostable multivibrators using NE555 Timer.	6
10	PLL characteristics and its use as Frequency Multiplier	3
11	DC power supply using LM317 and LM723.	3
12	Study of SMPS.	
13	Revision	3

P : 45 TOTAL : 45

LIST OF EQUIPMENTS AND COMPONENTS FOR A BATCH OF 20 STUDENTS

Sl. No.	Description	Quantity	Remarks
1	Dual ,(0-30V) variable Power Supply	10	
2	CRO	6	Minimum 20 MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1 MHz
5	IC tester(analog)	1	
6	Bread board	25	
Consumables		(Minimum of 25 Nos. each)	
7	IC 741	25	
8	NE 555	10	
9	NE/SE 565	10	
10	Transistor - 2N3391	25	
11	Diodes,IN4001,BY126	25	
12	Zener diodes	10	
13	Potentiometer	15	
14	Step-down transformer	3	230V/12-0-12V
15	Capacitor Assorted	100	
16	Resistors 1/4 Watt Assorted	100	
17	LM 317	10	
18	LM 723	10	
19	DC Voltmeter(various Ranges)	20	
20	DC Voltmeter(various Ranges)	20	
21	Single Strand Wire	As Per Requirement	

EE2532 POWER ELECTRONICS LABORATORY

2 CREDITS

COREQUISITE

EE2501 - Power Electronics

GOAL

To study the characteristics of switching devices and its applications in rectifier, inverter, chopper and resonant converter.

OBJECTIVES

The course will enable the students to:

(i) Obtain the characteristics of SCR, TRIAC ,MOSFET, IGBT.

(ii) Obtain the characteristics of rectifiers,choppers,invertersand resonant converters.

OUTCOME

The students should be able to:

(i) Understand the characteristics of all the power semiconductor devices.

(ii) Analyse the performance parameters of Rectifiers, choppers and Inverters.

LIST OF EXPERIMENTS

S. No.	List of Experiment	No. of Hours
1	Characteristics of SCR	3
2	Characteristics of TRIAC	3
3	Characteristics of MOSFET and IGBT	6
4	Triggering circuits for SCR	
	a. UJT Trigger circuit	
	b. R firing circuit	
	c. RC Firing circuit	6
5	Transient characteristics of SCR and MOSFET	3
6	AC to DC half and fully controlled converter	6
7	Step down and step up MOSFET based choppers	3
8	IGBT based single-phase PWM inverter	3
9	Zero voltage switching resonant dc-dc converter	3
10	Zero current switching resonant dc-to-dc converter	3
	Revision lab &Model exam	6
		P : 45 TOTAL : 45

LIST OF EQUIPMENTS

S.No.	Description of Equipment	Quantity required
1.	Static characteristic module (for SCR,MOSFET, TRIAC and IGBT) with built in power supply & meters	2each
2.	SCR firing circuit module	2
3.	Single phase SCR based half controlled converter & fully controlled converter along with built-in separate firing circuit module and meter	2 each
4.	MOSFET based step up and step down choppers	1
5.	IGBT based single phase PWM inverter module	2
6.	Resonant DC-DC conveter module with built in power supply and controller	2
7.	SCR & TRIAC based 1 phase A.C. phase controller along with lamp or rheostat load	1
8.	Dual regulated DC power supply with common ground	4
9.	Cathode Ray Oscilloscope	5
10.	Single phase Autotransformer	1
11.	Components (Inductance, Capacitance)	3 sets for each
12.	Multimeter	2
13.	LCR meter	1
14.	Rheostats of various ranges	2 sets of 10 value
15.	Work tables	10
16.	DC and AC meters of required ranges	20

CS2335 DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++
2 CREDITS

GOAL

To teach the principles of good programming practice and to give a practical training in writing efficient programs in C++

OBJECTIVES

The course should enable the student to:

(i) Write programs in C++

(ii) Implement the various data structures as Abstract Data Types

(iii) Write programs to solve problems using the ADTs

(iv) Introduce constants, variables, data types, operators, classes, objects, methods

(v) Introduce inheritance,Abstract classes,Virtual functions

OUTCOME

The students should be able to:

(i) Have gained knowledge in problem solving techniques.

(ii) Be capable of writing programs using list, stack and queue.

(iii) Have obtained confidence in storing data in tree and other related data structures.

(iv) Have grasped knowledge in various sorting techniques.

(v) Have learnt the concepts in Inheritance,Abstract classes and virtual functions.

LIST OF EXPERIMENTS

Implement the following exercises using C++

S.No	List of Experiments	No. of Hours
1	Array implementation of List Abstract Data Type (ADT)	5
2	Array implementations of Stack ADT	4
3	Linked list implementations of Stack ADT	4
4	Array implementation of Queue ADT	4
5	Linked list implementation of Queue ADT	4
6	Balanced Paranthesis' using array implementation of Stack ADT	4
7	Balanced Paranthesis' using linked list implementation of Stack ADT	4
8	Evaluating Postfix Expressions' using array implementations of Stack ADT	4

9	Quick Sort	4
10	Compile time Polymorphism	
	a.Operator Overloading including Unary and Binary Operators.	
	b.Function Overloading	4
11	Runtime Polymorphism	
	a. Inheritance	
	b. Virtual functions	
	c. Virtual Base Classes	4

P : 45 TOTAL : 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30 STUDENTS

HARDWARE

LAN system with 30 nodes (OR) Standalone PCs - 30 Nos

Printers - 3 Nos

SOFTWARE

OS - Windows / UNIX

Software - C++ language

SEMESTER VI

EE2601 POWER SYSTEM ANALYSIS

4 CREDITS

PREREQUISITE

EE2402 - Transmission & Distribution

EE2302 - Electrical Machines - I

EE2401 - Electrical Machines - II

GOAL

To make the students to understand the different methods of power system analysis for power system planning and operation.

OBJECTIVES

The course will enable the students to:

(i) Analyze the different aspects of modeling of components of a modern power system.

(ii) Provide adequate knowledge in different power flow studies.

(iii) Give basic knowledge in different types of faults and methods to carry out the fault analysis.

(iv) Provide the concept of stability problems and the methods of determining the system stability.

OUTCOME

The students should be able to:

(i) Develop the mathematical model for carrying out the various types of power system analysis.

(ii) Understand the concept of the load flow problem formulation and the various numerical methods of solution.

(iii) Design a protective device for various faults.

(iv) Analyze unsymmetrical faults by applying symmetrical component methods.

(v) Understand the concept of system stability by applying equal area criterion and by using swing curve.

UNIT I THE POWER SYSTEM - AN OVERVIEW AND MODELLING 9

Modern Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system -Change of base.-per unit impedance diagrams.

UNIT II POWER FLOW ANALYSIS 9

Introduction - Bus Classification - Bus admittance matrix - Direct inspection method-singular transformation of primitive admittance matrix. Formulation of load flow problem. Solution of load flow problem, Gauss -Seidal method, Newon-Raphson method, Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III BALANCED FAULT ANALYSIS **9**

Introduction - Types of faults-Balanced three phase fault - short circuit capacity - algorithm for formation of bus impedance matrix. - systematic fault analysis using bus impedance matrix.

UNIT IV UNBALANCED FAULT ANALYSIS **9**

Introduction - Fundamentals of symmetrical components - sequence impedances - sequence networks - single line to ground fault - line to line fault - Double line to ground fault - Unbalanced fault analysis using bus impedance matrix.

UNIT V POWER SYSTEM STABILITY **9**

Basic concepts and definitions -Classification of stability-Steady state stability - An elementary view of transient stability - Equal area criterion - Reponses to a short circuit fault- factors influencing transient stability - Numerical integration methods - Euler method - modified Euler method - Runge - Kutta methods.

L=45, T=15, TOTAL = 60

TEXT BOOKS:

1. Hadi Saadat " Power system analysis", Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. P.Kundur, "Power System Stability and Control", Tata McGraw Hill Publishing Company, New Delhi, 2008.

REFERENCES

1. I.J.Nagrath and D.P.Kothari, 'Modern Power System Analysis', Tata McGraw-Hill publishing company, New Delhi, 2007.
2. M.A. Pai, 'Computer Techniques in power system Analysis', Tata McGraw - Hill publishing company, New Delhi, 2005.

EE2602 SOLID STATE DRIVES

4 CREDITS

PREREQUISITE

EE 2501 - Power Electronics

GOAL

To provide knowledge about the operation of electric drives controlled from a power electronic converter and to introduce the design concept of controllers.

OBJECTIVES

The course will enable the students to:

(i) Provide the concept of drive characteristics, four quadrant operation and different modes of operation of electric drives and regenerative braking.

(ii) Give basic knowledge in analysis of single and three phase fully controlled converter fed DC motor drive and chopper fed DC drive

(iii) Provide the concept of induction motor control and induction motor drives.

(iv) Give adequate knowledge about various types of control in synchronous motor and types of permanent magnet synchronous motor.

(v) Acquire knowledge about transfer function for dc motor , load and converter and design of controllers

OUTCOME

The students should be able to:

(i) Select the suitable drive for the required load characteristics..

(ii) Understand the concept of Converter / Chopper control of Dc motor drive.

(iii) Gain adequate knowledge about induction motor and synchronous motor drive and various speed control methods.

(iv) Design controllers for drives.

UNIT I DRIVE CHARACTERISTICS 9

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control - Slip-power recovery drives - Adjustable frequency drives: v/f control, constant slip-speed control and constant air-gap flux control - Basics of voltage/current fed inverters - Block diagram of closed loop drive.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

Open loop volts/hertz control and self-control of synchronous motor: Marginal angle control and power factor control - Permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for dc motor, load and converter - Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control - Design of controllers: Current controller and speed controller - Converter selection and characteristics.

L : 45 P : 15 Total : 60

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2003.

2. G.K. Dubey, 'Fundamentals of Electrical Drives ' Narosa Publishing House , New Delhi 2nd Edition 2001,

REFERENCES

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.

2. S.K. Pillai, 'A First Course on Electrical Drives', Wiley Eastern Limited, 1993.

3. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

EE2603 HIGH VOLTAGE ENGINEERING

3 CREDITS

PREREQUISITE

EE2501 - Power Electronics

COREQUISITE

EE2602 - Solid State Drives

GOAL

To provide knowledge about the testing of apparatus and measurements of overvoltages.

OBJECTIVES

The course will enable the students to:

(i) Give exposure on various types of over voltage transient in power system and its effect

(ii) Study about generation of overvoltages.

(iii) Provide knowledge on the measurement of electrical breakdown in various medium

(iv) Give basic knowledge in testing of power apparatus.

OUTCOME

The students should be able to:

(i) Understand the types of overvoltage transients on power system

(ii) Gain knowledge about the testing of power apparatus and generation of over voltages

(iii) Comprehend about the measurement of electrical breakdown in various medium

(iv) Understand the concept of insulation coordination.

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 6

Causes of over voltages and its effects on power system - Lightning, switching surges and temporary over voltages - protection against over voltages - Bewley's lattice diagram.

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 10

Gaseous breakdown in uniform and non-uniform fields - Corona discharges - Vacuum breakdown - Conduction and breakdown in pure and commercial liquids - Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 10

Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 10

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

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus - Power frequency, impulse voltage and DC testing - International and Indian standards - Insulation Coordination.

L : 45 TOTAL : 45

TEXT BOOKS

1. M. S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, 3rd Edition, 2004.
2. E. Kuffel and W. S. Zaengel, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, 1986.

REFERENCES

1. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon Press, Oxford, 1970.
2. L. L. Alston, Oxford University Press, New Delhi, First Indian Edition, 2006.

EE2604 MICROPROCESSOR AND MICROCONTROLLER

4 CREDITS

PREREQUISITE

EE2404 - Digital Logic Circuits

EE2503 - Linear Integrated Circuits

GOAL

To excel in the Architecture of 8085,8086 & 8051 and to develop skill in simple program writing, to study simple applications.

OBJECTIVES

The course should enable the students to :

(i) Study the Architecture of 8085, 8086 & 8051.

(ii) Know the addressing modes & instruction set of 8086 & 8051.

(iii) Know the need & use of Interrupt structure.

(iv) Program simple coding.

(v) Understand commonly used peripheral / interfacing ICs.

OUTCOME

The students should be able to:

(i) Understand the functional block diagram, Timing Diagram, Interrupt structure and Multiprocessor configurations of 8086 Microprocessor.

(ii) Develop the Programming skills using Loop structure with counting & Indexing, Look up table, Subroutine instructions stack.

(iii) Interface ICs 8255 PPI, 8259 PIC, 8257 DMA , 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter ,A/D and D/A converter.

(iv) Comprehend the Functional block diagram ,Instruction format and addressing modes, Interrupt structure ,I/O Ports and Serial communication of 8051 Microcontroller.

(v) Develop the programming skills in PID control algorithm, square, triangular and sine wave form generation, closed loop control of servo motor and stepper motor control.

UNIT I 8085 and 8086 PROCESSOR 12

Functional block diagram - Signals - Memory interfacing - I/O ports and data transfer concepts - Timing Diagram - Interrupt structure - Multiprocessor configurations.

UNIT II PROGRAMMING OF 8086 PROCESSOR 12

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

UNIT III PERIPHERAL INTERFACING 12

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8257 DMA 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter - Interfacing with 8085 - A/D and D/A converter interfacing.

UNIT IV MICROCONTROLLER 8051 12

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

UNIT V MICROCONTROLLER PROGRAMMING & APPLICATIONS 12

Data Transfer, Manipulation, Control & I/O instructions - Simple programming exercises, PID control algorithm - wave form generation:- square, triangular and sine, key board and display interface - Closed loop control of servo motor- stepper motor control.

L : 45 T : 15 TOTAL : 60

TEXT BOOKS

1. "Microprocessor and Microcontrollers", Krishna Kant Eastern Company Edition, Prentice - Hall of India, New Delhi , 2007.
2. A K Ray and K M Burchandi, Advanced Microprocessor and Peripherals, Tata McGraw -Hill - 2004
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. William Kleitz, Microprocessor and Microcontroller Fundamental of 8085 and 8051 Hardware and Software, Pearson Education, 1998.
2. Yu-Cheng Liu and Glenn A.Gibson, Microcomputer Systems: The 8086/8088 family, Second Edition, Prentice Hall of India.
3. The 8088 & 8086 Microprocessors , Walter A Tribal & Avtar Singh, Pearson, 2007, Fourth Edition.

EE2605 DESIGN OF ELECTRICAL APPARATUS

4 CREDITS

PREREQUISITE

EE2302 - Electrical Machines - I

EE2401 - Electrical Machines - II

GOAL

To provide knowledge about fundamental design processes for electrical machines such as d.c. machines, transformers, induction machines& synchronous machines

OBJECTIVES

The course should enable the students to:

(i) Get exposed to the concepts of electromagnetic fields as applied to electrical machines

(ii) Acquire basic knowledge about critical design parameters

(iii) Design various electrical machines from the performance parameters.

OUTCOME

The students should be able to:

(i) Design common DC and ACrotating machines .

(ii) Design the core, windings and cooling system for transformers

(iii) Grasp industrial design processes with a minimum learning curve.

UNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTRICAL MACHINES 9

Concept of magnetic circuit - MMF calculation for various types of electrical machines - real and apparent flux density of rotating machines - leakage reactance calculation for transformers, induction and synchronous machine - thermal rating: continuous, short time and intermittent short time rating of electrical machines-direct and indirect cooling methods - cooling of turbo alternators.

UNIT II D.C. MACHINES 9

Constructional details - output equation - main dimensions - choice of specific loadings - choice of number of poles - armature design - design of field poles and field coil - design of commutator and brushes - losses and efficiency calculations.

UNIT III TRANSFORMERS 9

Constructional details of core and shell type transformers - output rating of single phase and three phase transformers - optimum design of transformers - design of core, yoke zand windings for core and shell type transformers - equivalent circuit parameter from designed data - losses and efficiency calculations - design of tank and cooling tubes of transformers.

UNIT IV THREE PHASE INDUCTION MOTORS 9

Constructional details of squirrel cage and slip ring motors - output equation - main dimensions - choice of specific loadings - design of stator - design of squirrel cage and slip ring rotor - equivalent circuit parameters from designed data - losses and efficiency calculations.

UNIT V SYNCHRONOUS MACHINES 9

Constructional details of cylindrical pole and salient pole alternators - output equation - choice of specific loadings - main dimensions - short circuit ratio - design of stator and rotor of cylindrical pole and salient pole machines - design of field coil - performance calculation from designed data - introduction to computer aided design.

L : 45 T : 15 TOTAL : 60

TEXT BOOKS

1. A.K. Sawhney, 'A Course in Electrical Machine Design', DhanpatRai and Sons, New Delhi, 2005.
2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxford and IBH Publishing Co.Pvt Ltd., New Delhi, 2006.

REFERENCES

1. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2010.
2. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications and Distributors, Delhi, 2002.

GE2001 PROFESSIONAL ETHICS & HUMAN VALUES

3 CREDITS

GOAL

To create awareness on Engineering Ethics and Human Values and make the students understand the moral values that ought to guide in the Engineering profession.

OBJECTIVES

The course should enable the students to:

(i) Deal with issues they will face in professional practice.

(ii) Understand 'public good' which encompasses care and respect for the environment and for humanity's cultural, historical, and to protect the health and well being of present and future generations.

(iii) Uphold and advance the integrity, honor and dignity of the engineering profession by being honest and impartial, and serving with fidelity the public, their employers and clients

OUTCOME

The students should be able to:

(i) Know about the moral conducts of an ethical engineer.

(ii) Behave in and as a professional role

(iii) Act in an efficient way as they do know about the previous issues related to the incidents.

UNIT I HUMAN VALUES 9

Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, caring, Sharing, Honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self-Confidence, Character, Spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy ,Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

L : 45 TOTAL : 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 2006.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India,New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics ,Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.

EE2631 MICROPROCESSOR AND MICROCONTROLLER LABORATORY

2 CREDITS

PREREQUISITE / CO REQUISITE

EE 2604 - Microprocessor and Microcontroller

EE2404 - Digital Logic Circuits

GOAL

To understand programming using instruction sets of processors and controllers.

OBJECTIVES

The course should enable the students to :

(i) Develop skill in simple program writing for 8086 Microprocessors and Microcontrollers.

(ii) Introduce commonly used peripheral / interfacing ICs

(iii) Study simple applications like D / A converter and A/D Converter.

(iv) Understand about assembler and simulator tools

OUTCOME

The students should be able to:

(i) Develop skill in simple program writing for 8086 Microprocessors Simple arithmetic operations, Programming with control instructions.

(ii) Interface Analog to Digital Converter, Digital to Analog Converter, experiments using 8251, 8279, 8254

(iii) Program on assembler and simulator tools.

(iv) Perform Parallel port programming with 8051 with Stepper motor and D / A converter.

LIST OF EXPERIMENTS

16-BIT MICROPROCESSOR

S.No.	List of Experiment	No. of Hours
1	8-bit arithmetic operations	3
2	16-bit arithmetic operations	3
3	Double Precision Arithmetic operations	3
4	8-bit multiplication using rotate instruction & Sorting of N numbers	3
5	Greatest & Smallest of N numbers in a given array	3
6	Code Conversions	3
7	Square & Square root of a given number using Look-up Table method	3
8	Interfacing ADC & DAC with 8086	3
9	Traffic Light Control & Keyboard Display Interfacing using 8086	3
10	Interfacing 8086 with 8254 & 8251	3
11	Programming practice on assembler & simulation tools	3
12	8-bit arithmetic operations using 8051 microcontroller	3
13	RAM direct addressing & bit addressing	2
14	Stepper Motor Interfacing using 8051	3
15	Programming practice using simulation tools & C-compiler	3
16	Study of Microcontrollers with flash memory	1

P : 45 TOTAL : 45

LIST OF EQUIPMENTS

S.No.	Description of Equipment	Quantity required
1.	8086 Microprocessor Trainer with Power supply	15
2.	8051 Micro controller Trainer Kit with power supply	15
3.	8255 Interface board	5
4.	8251 Interface board	5
5.	8259 Interface board	5
6.	8279 Keyboard/Display Interface Board	5
7.	8254 timer counter	5
8.	ADC card	5
9.	DAC card	5
10.	Stepper motor with Controller	5
11.	Traffic Light Control System	5
12.	Regulated power supply	10
13.	Universal ADD-ON modules	5
14.	8 Digit Multiplexed Display Card	5
15.	Multimeter	5
16.	C R O	2

EL2431 COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

3 CREDITS

GOAL

The goal of the programme is to provide the learners with the methods and materials required for becoming accomplished personalities through the medium of English.

OBJECTIVES

The course should enable the students to :

1. Be aware of self-knowledge by exposure to soft skills, values, behaviour, attitudes, temperamental changes, and a positive attitude to life.
2. Learn personality traits and undergo personality tests to determine their own personality characteristics and the scope for improvement.
3. Cultivate the art of speaking fluently making use of proper gestures, tone and voice modulation, adding humour to the speech.

4. Figure out the need to work in teams, adorn or accept team leadership, and make use of body language to enhance team spirit.

5. Be familiar with the art of managing self, people, work and time, keeping in mind problems like time-wasters and stress-builders.

OUTCOME

The students should be able to:

1. Apply the knowledge gained to improve upon their values, behaviour, attitude, and develop the soft skills required for home, workplace and the society.

2. Employ the concept of personality traits and build up an accomplished personality that would be pleasing to people around so as to influence them positively.

3. Develop a personal style and communicate fearlessly and effectively in a convincing manner so as to impress listeners or the audience.

4. Participate in presentations, group discussions, debates and mock interviews making good use of language skills and interpersonal relationships.

5. Comprehend stress-management tips to overcome stress-prone habits and develop a career plan with personal, familial and societal goals for success.

UNIT I **20**

Values and attitudes - Value-formation - Values & education - Terminal & Instrumental values - Civic responsibilities - The power of Personal/ Cultural/ Social valves -- Behaviour and attitudes -- Features of attitudes - Developing positive attitude - Overcoming negative attitude -- People skills - Soft skills as per the Work Force Profile - The four temperaments - Sanguine - Choleric - Melancholic - Phlegmatic -- Tests for Personal Chemistry.

UNIT II **20**

What is personality development? - Types of personalities as per (i) Heredity (ii) Environment (iii) Situation - the 16 personality factors - MBTI Tests - Personality types - Increasing self awareness: Assessing one's locus of control, Machiavellianism, self-esteem, self-monitoring, risk-taking, Type A, Type B personality elements - Intellectual and physical abilities for jobs -- Personality tests.

UNIT III **20**

Developing the art of speaking - How to get rid of stage fright? - Enhancing fluency - Modulating voice - Enunciation - Positive and negative gestures - Preparation - How to begin? - How to convince the listeners? - How to wind up the speech? - Adding humour and illustration - Developing one's own style - Types of style - How to influence the audience? - How to become an effective speaker? -- Tests for effective speaking.

UNIT IV **20**

Team work - Team building - Team leadership -- How to face an interview? -- How to participate in a group discussion? - How to argue for or against in a debate? - Body language - non-verbal

communication - personal appearance - facial expression - posture - gestures - eye contact - Etiquette - Voluntary and involuntary body language -Gender implications -- Tests.

UNIT V **20**

Managing self, people, work, situations - Time-management - Secrets of time-management - Time-wasters - Stress -- Kinds of stress - Spotting stress - Stress-builders - Stress -management tips - Stress-prone habits -- Goals - Career planning - Interpersonal interaction - Interpersonal relationships -- Tests.

Study material will be prepared by the Department of Languages.

Tests suggested will be prepared by a senior faculty of the department.

Movies will be screened to discuss and debate on the topics introduced in each unit.

LABORATORY REQUIREMENTS

1. Career Lab:1 room
2. 2 Computers as a Server for Labs (with High Configuration)
3. Headphones with Mic (i-ball) - 100 Nos
4. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
5. Teacher table, Teacher Chair - 1 + 1
6. Plastic Chairs - 75 Nos

EE2633 POWER SYSTEM SIMULATION LABORATORY-I

2 CREDITS

PREREQUISITE / CO REQUISITE

EE 2601 - Power System Analysis

EE 2502 - Transmission and Distribution

GOAL

To expose the various power system parameters through computational procedures using software languages and MATLAB/simulink.

OBJECTIVES

The course should enable the students to :

(i) Modeling of transmission line

(ii) Electromagnetic transients in travelling waves

(iii) Formation of bus admittance matrix

(iv) Different methods of power flow analysis

(v) Formation of bus impedance matrix using building algorithm.

(vi) Short circuit analysis of transmission line

(vii) Stability analysis of power system

(viii) Analysis of switching surge using ETAP

OUTCOME

The students should be able to:

(i) Determine the various line parameters of a transmission line

(ii) Identify the types of transients in travelling waves.

(iii) Form the bus admittance matrix for the given power system network by Step by step method or singular transformation method.

(iv) Carry out load flow analysis for the given power system network by using Gauss-seidel method and determine line losses.

(v) Determine the bus parameters and line flows using Newton-Raphson load flow analysis.

(vi) Analyze fault in the transmission line using bus impedance matrix.

(vii) Analyze fault in the transmission line using short circuit capacity.

(viii) Analyze the stability of the given power system network using swing curve.

(ix) Analyze of Energization and De-Energisation of transmission line

(x) Determine the bus parameters and line flows using Fast decoupled method

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Modeling of transmission line	5
2	Electromagnetic transients in travelling waves	4
3	Formation of bus admittance matrix	4
4	Power flow analysis by Gauss-seidel method	5
5	Power flow analysis using Newton-Raphson method	6
6	Formation of bus impedance matrix using building algorithm	4
7	Short circuit analysis of transmission line	4
8	Stability analysis of power system	5
9	Analysis of switching surge using ETAP	4
10	Power flow analysis by Fast decoupled method	4
		P : 45 Total : 45

LIST OF EQUIPMENTS

Sl. No.	Description	Specification	Quantity
1	Computer	Pentium 4	30
2	ETAP software	ETAP Ver 12.1	10 licence user
3	MATLAB	MATLAB Ver 7.1	10 licence user
4	Turbo C	C & C++	30 user

SEMESTER-VII

EE2701 PROTECTION & SWITCHGEAR

3 CREDITS

PREREQUISITE

EE2402 - Transmission & Distribution

GOAL

To expose the students to various faults in power systems and the methods of detecting them; the basics of arc interruption and the various types of switchgear.

OBJECTIVES

The course will enable the students to:

(i) Study the different types of faults in a power system

(ii) Provide knowledge on different methods of earthing power system.

(iii) Give basic knowledge on different types of protective relays and their applications.

(iv) Provide the concept of arc interruption models and their application with respect to switchgear Study the various types of circuit breakers and testing

OUTCOME

The students should be able to:

(i) Apply the Symmetrical Components techniques for fault analysis.

(ii) Evolve appropriate protection schemes and select the necessary protective relays

(iii) Have adequate knowledge on circuit breakers

UNIT I INTRODUCTION **9**

Principles and need for protective schemes - nature and causes of faults - types of faults - fault current calculation using symmetrical components - Power system earthing - Zones of protection and essential qualities of protection - Protection scheme.

UNIT II OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS **9**

Electromagnetic relays - Over current, directional, distance and differential, under frequency relays - static relays.

UNIT III APPARATUS PROTECTION **9**

Apparatus protection: transformer, generator, motor- protection of bus bars & transmission lines - CTs and PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION **9**

Physics of arc phenomena and arc interruption. Restriking voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, interruption of capacitive current - DC circuit breaking.

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.

TOTAL = 45

TEXT BOOK

1. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2011.

REFERENCES

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi, 2003.

EE2702 POWER SYSTEM OPERATION AND CONTROL

4 CREDITS

PREREQUISITE

EE2502 - Transmission & Distribution

EE2601 - Power System Analysis

EE2403 - Control Systems

GOAL

To become familiar with the preparatory work necessary for understanding the operation and the various control actions to be implemented on the power system to meet the minute-to-minute variation of system load.

OBJECTIVES

The course will enable the students to:

(i) Have an overview of system load variation, reserve requirements, operation and control of power system.

(ii) Give an insight into the role of speed governing mechanism in load frequency control, concept of control area, modeling and analysis of load frequency control loop.

(iii) Give knowledge of excitation systems and the methods of voltage control.

(iv) Study the economic dispatch of generated power.

(v) Provide adequate knowledge of the functions of energy control centre , SCADA system and the security control.

OUTCOME

The students should be able to:

(i) Understand the need for power system operation and control .

(ii) Get knowledge of the mechanism involved in maintaining the frequency constant by controlling the real power, when there is a system load variation.

(iii) Understand voltage constancy and the methods of voltage control.

(iv) Learn economic scheduling of load among the generators and the concept of economic dispatch.

(v) Understand the methods of computer control using energy control centre and SCADA.

UNIT I INTRODUCTION 9

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor, . Reserve requirements: spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control:Governor control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER-FREQUENCY CONTROL 9

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics - Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: 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 system. Derivation of state variable model.

UNIT III REACTIVE POWER-VOLTAGE CONTROL 9

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 9

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.

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

UNIT V COMPUTER CONTROL OF POWER SYSTEMS **9**

Energy control centre: Functions - Monitoring, data acquisition and control. System hardware configuration - SCADA and EMS functions, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies.

L : 45 T : 15 TOTAL : 60

TEXT BOOKS

1. Olle. I. Elgerd, "Electric Energy Systems Theory - An Introduction", Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2008.
2. Allen.J.Wood and Bruce F.Wollenberg, "Power Generation, Operation and Control", John Wiley & Sons, Inc., 2003.
3. P. Kundur, "Power System Stability & Control", McGraw Hill Publications, USA, 2008.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2004.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2012.

EE2703 SPECIAL ELECTRICAL MACHINES

3 CREDITS

PREREQUISITE

EE2202 - Electrical Machines - I

EE2401 - Electrical Machines - II

GOAL

To expose the students to the construction, principle of operation and performance of special electrical machines such as synchronous reluctance motor, switched reluctance motor, stepper motor, permanent magnet synchronous motor etc.

OBJECTIVES

The course will enable the students to:

(i) Provide the concept of construction, operating principle and characteristics of synchronous reluctance motor, stepper motor and switched reluctance motor..

(ii) Give basic knowledge about the principle of operation, analysis, emf and torque equation, and control of permanent magnet synchronous motors and brushless DC motors

OUTCOME

The students should be able to:

(i) Gain knowledge about construction, operating principle and characteristics of synchronous reluctance motor, stepper motor and switched reluctance motor..

(ii) Comprehend about permanent magnet synchronous motors and brushless DC motor and its applications.

UNIT I STEPPING MOTORS 9

Constructional features, principle of operation, modes of excitation ,torque production in Variable Reluctance (VR) stepping motor, Dynamic characteristics, Drive systems and circuit for open loop control, Closed loop control of stepping motor

UNIT II SWITCHED RELUCTANCE MOTORS 9

Constructional features, principle of operation. Torque equation, Power controllers, Characteristics and control Microprocessor based controller.

UNIT III PERMANENT MAGNET BRUSHLESS DC MOTORS 9

Commutation in DC motors, Difference between mechanical and electronic commutators, Hall sensors, Optical sensors, Multiphase Brushless motor, Square wave permanent magnet brushless motor drives, Torque and emf equations, Torque-speed characteristics, Controllers-Microprocessor based controller.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation, EMF, power input and torque expressions, Phasor diagram, Power controllers, Torque speed characteristics, Self control, Vector control, Current control schemes.

UNIT V SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features: axial and radial air gap Motors. Operating principle, reluctance torque - phasor diagram, motor characteristics.

L : 45 T : 15 Total : 60

TEXT BOOK

1. K.Venkataratnam 'Special Electrical Machines' University Press, Hyderabad, 2008.

REFERENCES

1. T.J.E Miller,'Brushless Permanent Magnet and Reluctance Motor Drives'. Clarendon Press, Oxford, 1989.

2. Kenjo, T and Naganori, S " Permanent Magnet and brushless DC motors ", Clarendon Press, Oxford, 1989.

3. B.K. Bose, "Modern Power Electronics & AC drives" Pearson Education, 2002.

4. R.Krishnan, " Electric Motor Drives - Modeling, Analysis and Control", Prentice-Hall of India Pvt. Ltd., New Delhi, 2003.

MG2001 PRINCIPLES OF MANAGEMENT

3 CREDITS

GOAL

To impart the concepts of Economics and Management learning in an Engineering and to make a Creative Engineer.

OBJECTIVES

The course will enable the students to:

(i) Get an overview about Economics and to know the importance of economics in engineering field.

(ii) Give knowledge on the engineering plant, factors, procedures, plant set up.

(iii) Provide the concepts of Management, Planning, and Decision making for the various situations.

(iv) Analyze the Concepts of Organized structure, and Human Resource Development

(v) Study the Communication Process in Organization and Global Environment.

OUTCOME

The students should be able to:

(i) Learn the Importance of Economics in engineering field.

(ii) Design the Engineering plant, factors, procedures, plant set up for the various cases.

(iii) Make Decision for the various situations in Economics / Engineering fields.

(iv) Solve the Case studies of organized structure, and Human Resource Development.

(v) Understand / make good Communication Process in Organization and Global Environment.

UNIT I HISTORICAL DEVELOPMENT 9

Definition of Management - Science or Art - Management and Administration - Development of Management Thought - Contribution of Taylor and Fayol - Functions of Management - Types of Business Organisation.

UNIT II PLANNING 9

Nature & Purpose - Steps involved in Planning - Objectives - Setting Objectives - Process of Managing by Objectives - Strategies, Policies & Planning Premises- Forecasting - Decision-making.

UNIT III ORGANISING 9

Nature and Purpose - Formal and informal organization - Organization Chart - Structure and Process - Departmentation by difference strategies - Line and Staff authority - Benefits and Limitations - De-Centralization and Delegation of Authority - Staffing - Selection Process - Techniques - HRD - Managerial Effectiveness.

UNIT IV DIRECTING **9**

Scope - Human Factors - Creativity and Innovation - Harmonizing Objectives - Leadership - Types of Leadership Motivation - Hierarchy of needs - Motivation theories - Motivational Techniques - Job Enrichment - Communication - Process of Communication - Barriers and Breakdown - Effective Communication - Electronic media in Communication.

UNIT V CONTROLLING **9**

System and process of Controlling - Requirements for effective control - The Budget as Control Technique - Information Technology in Controlling - Use of computers in handling the information - Productivity - Problems and Management - Control of Overall Performance - Direct and Preventive Control - Reporting - The Global Environment - Globalization and Liberalization - International Management and Global theory of Management.

L : 45 Total : 45

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata Mcgraw Hill,1998.
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES

1 Tripathy PC And Reddy PN, " Principles of Management", Tata Mcgraw Hill,1999.

2. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, " Engineering Management", Addison Wesley -2000.

EE2704 REAL TIME SYSTEMS

3 CREDITS

GOAL

To develop in-depth skills in Real Time Operating Systems.

OBJECTIVES

The course will enable the students to:

(i) ReviewOperatingSystems.

(ii) Understand about DistributedOperatingSystems.

(iii) Learn RealTimeModelsandLanguages.

(iv) Understand about introductiontoRealTimeKernels.

(v) Understand about RTOS andApplicationDomains.

OUTCOME

The students should be able to:

(i) Explain various operating systems

(ii) Explain Basic building blocks of Real time Systems.

(iii) Interface various peripherals to RTOS.

(iv) Program Real time Systems.

(v) Develop Real time Systems.

UNIT I REVIEW OF OPERATING SYSTEMS 9

Basic Principles-systemcalls-Files-Processes-Design and implementation of processes - Communicationbetween processes operating system structures.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Topology-Network Types-Communication-RPC-Client server model- Distributed file systems.

UNIT III REAL TIME MODELS AND LANGUAGES 9

Eventbased - Processbased - Graphmodels - Petrinetmodels - RTOS tasks -RTscheduling- Interrupt processing-Synchronization-Control blocks-Memory requirements.

UNIT IV REAL TIME KERNEL 9

Principles - Polledloopsystems - RTO Sporting to a target - Comparison and Study of RTOS- VX Works and µCoS, Introduction to POSIX and OSEK standards.

UNIT V RTOS AND APPLICATION DOMAINS **9**

RTOS for Control-Embedded RTOS for Control over IP - RTOS for fault tolerant applications -RTOS for control systems.

L : 45 TOTAL : 45

TEXTBOOKS

1. HermannK, 'Realtimesystems-designprinciplesfordistributedembeddedApplications', Kluweracademic, 1997.
2. CharlesCrowley'operatingsystems-Adesignorientedapproach'McGrawHill, 1998

REFERENCES

1. Rajbuhr, DLBeily, 'An introductiontorealtimesystems'PHI, 1999
2. CMKrishna,KangG. Shin, 'Real time Systems', Mc GrawHill, 1997
3. RaymondJ.A.,DonaldLBaily, 'An introductiontorealtimeoperatingsystems'PHI, 1999.

EE2731 POWER SYSTEM SIMULATION LABORATORY-II

2 CREDITS

PREREQUISITE / COREQUISITE

EE 2702 - Power System Operation and Control

EE2601 - Power System Analysis

GOAL

To expose the steady state operation of power system through computational procedures using software languages and simulink.

OBJECTIVES

The course should enable the students to :

(i) Load frequency dynamics of single area and two area system.

(ii) Unit commitment by Brute-Force method

(iii) Economic dispatch with and without loss

(iv) Stability analysis of single machine infinite bus system

(v) Fault analysis-Unsymmetrical fault

(vi) Small-signal stability analysis of multi-machine configuration

(vii) Computation of transient recovery voltage

(viii) Design of compensators for power system network

(ix) Load flow analysis with SVC

OUTCOME

The students should be able to:

(i) Become familiar with modeling and analysis of the frequency and tie line flow dynamics of a power system without and with load frequency controller and to design and better controller for getting better response

(ii) Determine the most economical units to be committed for given load

(iii) Determine the optimum scheduling of generation for the given fuel cost function with/without including the losses using lamda iteration method.

(iv) Determine the stability of the system using swing curve.

(v) Determine the fault current for the given power system network

(vi) Determine the multi-machine stability for the power system network.

(vii) Transient recovery voltage can be calculated using ETAP

(viii) Transmission line losses can be minimized by the addition of compensators in transmission line network

(ix) Study the performance of static var compensator using power flow analysis.

LIST OF EXPERIMENTS

S.No.	List of Experiment	No. of Hours
1	Fault analysis-unsymmetrical fault	4
2	Unit commitment by dynamic programming/priority list method	4
3	Economic dispatch with and without loss	5
4	Stability analysis of single machine infinite bus system	4
5	Small-signal stability analysis of multi-machine configuration	5
6	load frequency dynamics of single area system.	4
7	load frequency dynamics of two area system	4
8	Computation of transient recovery voltage	4
9	Design of compensators for power system network	6
10	Load flow analysis with SVC	5
		P : 45 TOTAL : 45

LIST OF EQUIPMENTS

S.No.	Description	Specification	Quantity
1	Computer	Pentium 4	30
2	ETAP software	ETAP Ver 12.1	10 licence user
3	MATLAB	MATLAB Ver 7.1	10 licence user
4	Turbo C	C & C++	30 user

EE2732 ELECTRICAL DRIVES AND CONTROL LABORATORY

2 CREDITS

PREREQUISITE

EE 2602 - Solid State Drives

EE 2501 - Power Electronics

EE2604 - Microprocessor and Microcontroller

GOAL

To expose the students to the various control techniques of electrical machines and help them to extract their practical knowledge.

OBJECTIVES

The course should enable the students to :

(i) Speed control of Induction Motor using V/f method and 3 ø Voltage Source Inverter.

(ii) Speed control and braking of DC shunt motor using 3 ø converter.

(iii) Voltage & current control of DC motor using PLC.

(iv) Conventional and vector control of PMSM motor by using DSP.

(v) Two and four quadrant operation of a DC motor.

(vi) Open loop & Closed loop speed control of PMBLDC using PIC controller

(vii) Forward and Reverse operation of stepper motor by micro controller.

(viii) Speed control of universal motor using controlled rectifier.

OUTCOME

The students should be able to:

(i) Understand the various methods of speed control of induction motor.

(ii) Understand the methods of speed control and braking methods of dc motor using power electronics devices.

(iii) Analyze the current and voltage control of dc motor using the new technology PLCs,will help them to get industrial job opportunities.

(iv) PMSM motor control using vector control will enable them to go for higher studies.

(v) Analyze the dc motor operation in four quadrant using power electronics devices.

(vi) Get knowledge in control techniques of special electrical machines like BLDC, PMSM and Stepper motor.

(vii) Get knowledge in universal motor control techniques for different applications.

LIST OF EXPERIMENTS:

S. No.	Title of Experiment	No. of Hours
1	Speed control of Induction Motor using V/f method and 3 ø Voltage Source Inverter	4
2	Open loop & Closed loop speed control of BLDC using PIC controller	4
3	Speed control of universal motor using controller rectifier.	4
4	Two and four quadrant operation of a DC motor.	4
5	Conventional control of PMSM motor by using DSP/PIC	4
6	Vector control of PMSM motor by using DSP/PIC	4
7	Forward and Reverse operation of stepper motor by micro controller.	5
8	Braking methods of a DC motor.	
	a) Dynamic Braking	
	b) Regenerative Braking	
	c) Plugging	5
9	Speed control of DC shunt motor using 3 ø converter.	4
10	Voltage & current control of DC motor using PLC.	4
	Model Exam	3
		P : 45 TOTAL : 45

LIST OF EQUIPMENTS

Sl. No.	Description	Quantity
1	3Ø Induction motor	2
2	Permanent Magnet Stepper Motor (PMSM)	2
3	Brushless DC motor	2
4	Universal Motor	1
5	DC Shunt Motor	4
6	Stepper motor with 8051 interfacing card	1 set
7	BLDC interface kit with PIC	2 set
8	PMSM interface kit with PIC	2 set
9	Microcontroller motor interface kit(stepper motor, DC motor & Universal motor)	4 set
10	SCR, TRIAC,MOSFET & IGBT firing Module (6 pulse set)	5 set

11	PIC module training kit with interface card	4 set
12	DSP module training kit with interface card	3 set
13	Rectifier Unit	1
14	Fixed DC power supply	8
15	Cathode Ray Oscilloscope	6
16	Singlephase Autotransformer	2
17	Three phase Autotransformer	2
19	Multimeter	3
20	LCRmeter	1
21	Rheostats of various ranges	2 sets of 4 value
22	Work tables	10
23	DC and AC meters of required ranges	20

SEMESTER VIII

EE2801 ELECTRICAL ENERGY UTILIZATION &CONSERVATION

4 CREDITS

PREREQUISITE

EE2302 - Electrical Machines I

EE2401 - Electrical Machines - II

EE2602 - Solid State Drives

GOAL

To provide knowledge about the Industrial applications of generation, utilization &conservation.

OBJECTIVES

The course will enable the students to :

(i) Give exposure to the various sources of electric power generation.

(ii) Study the different methods of conservation of electric power.

(iii) Impart knowledge on the Lighting, Heating and welding methods.

(iv) Give adequate knowledge about electric traction system and their controls.

(v) Give exposure on the Industrial drives and load characteristics

OUTCOME

The students should be able to:

(i) Gain knowledge in different methods of electric power generation equipment.

(i) Comprehend about Energy conservation and energy management system.

(ii) Understand the concept of Industrial Heating, Welding and able to design lighting system for different applications.

(iii) Get knowledge on the latest trends of Electric drive system

UNIT I CONSERVATION **10**

Economics of Generation-Definitions -Load curves, Number &size of units-Cost of electrical energy-Tariff-Need for conservation-Conservation methods-Energy efficient equipment-

Energy Management and Auditing-Economics of power factor improvement-Design for improvement of power factor using power capacitors-Power Quality, Effect on conservation

UNIT II ILLUMINATION, HEATING AND WELDING **5**

Nature of radiation, Definition-Laws, Photometry-Lighting calculations-Design of illumination systems-Types of lamps, Energy efficient lamps

UNIT III HEATING AND WELDING **5**

Methods of heating, Requirement of heating material-Design of heating element, Furnaces-Welding generator, Welding transformer and its characteristics

UNIT IV ELECTRIC TRACTION **9**

Requirement of Ideal traction system-Supply Systems-Mechanics of train movement-Traction motors and control-Multiple units , Braking-Current collection systems-Recent trends in electric traction.

UNIT V DRIVES &THEIR INDUSTRIAL APPLICATIONS **8**

Motor selection and related factors-Loads-Types-Characteristics-Steady and Transient-Load Equalization-Industrial application-Modern methods of speed control of industrial drives.

L : 45 T :15 TOTAL : 60

TEXT BOOKS

1. C.L.WADHWA, "Generation Distribution and Utilization of Electrical Energy", New Age International (P) Ltd, 2003
2. B.R.Gupta, "Generation of electrical energy", Eurasia Publishing House (P) Ltd, New Delhi, 2003

REFERENCES

1. J.B.Gupta, "Utilization of electric power and Electric Traction", S.K.Kataria &Sons,2002.
2. Gopal K Dubey "Fundamentals of Electrical Drives", Narosa Publishing House (P) Ltd, new Delhi, 2002.

EE 2831 PROJECT & VIVA-VOCE

L	T	P	C	TCH
0	0	24	6	24

Evaluation Procedure

Review	Requirement	Weightage in Internal	Weightage in External	Duration
Zeroth Review	Title selection	-		At the end of 2 week from the start of semester
First Review	Literature review, Proposal for the project	10 %		At the end of 5 week from the start of semester
Second Review	Mathematical Analysis, Simulation output Circuit Working	20 %		At the end of 8 week from the start of semester
Model Review	Final Hardware kit	50%		At the end of 11 week from the start of semester
University Exam	Final Viva Voce		50%	At the end of 12 week from the start of semester

ELECTIVES
EE2751 ADVANCED CONTROL SYSTEM

3 CREDITS

PREREQUISITE

EE2403 - Control Systems

GOAL

To gain knowledge in state variable analysis, non-linear systems and optimal control.

OBJECTIVES

The course will enable the students to:

(i) Study the basics of state variable analysis

(ii) Provide adequate knowledge in the phase plane analysis.

(iii) To give a basic knowledge in describing function analysis.

(iv) Analyze the stability of the systems using different techniques.

(v) Study the design of optimal controller.

OUTCOME

The students should be able to:

(i) State variable analysis and its application

(ii) Phase plane analysis and application

(iii) Describing function and its analysis for common non-linearities

(iv) Various stability analysis techniques

(v) Various optimal control methods

UNIT I STATE VARIABLE ANALYSIS 9

Concept of state - State Variable and State Model - State models for linear and continuous time systems - Solution of state and output equation - controllability and observability - Pole Placement - State observer Design of Control Systems with observers.

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities - Methods of linearising non-linear systems - Concept of phase portraits - Singular points - Limit cycles - Construction of phase portraits - Phase plane analysis of linear and non-linear systems - Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities - Describing function analysis of non-linear systems - Conditions for stability - Stability of oscillations.

UNIT IV STABILITY ANALYSIS 9

Introduction - Liapunov's stability concept - Liapunov's direct method - Lure's transformation -Aizerman's and Kalman's conjecture - Popov's criterion - Circle criterion.

UNIT V OPTIMAL CONTROL 9

Introduction -Decoupling - Time varying optimal control - LQR steady state optimal control - Optimal estimation - Multivariable control design.

L : 45 TOTAL : 45

TEXT BOOKS

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

2. Ashish Tewari, 'Modern control Design with Matlab and Simulink', John Wiley, New Delhi, 2002.

3. M.Gopal, Modern control system theory, New Age International Publishers, 2002.

REFERENCES

1. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

2. Gene F. Franklin, J. David Powell and Abbasemami-Naeini, " Feedback Control of Dynamic Systems", Fourth edition, Pearson Education, Low price edition. 2002

EI2704 FIBER OPTICS & LASER INSTRUMENTS

3 CREDITS

GOAL

To provide knowledge about the Industrial applications of optical fibers and laser instruments.

OBJECTIVES

The course will enable the students to:

(i) Get exposed to the basic concepts of optical fibers and their properties.

(ii) Acquire adequate knowledge about the Industrial applications of optical fibers.

(iii) Acquire knowledge about Laser fundamentals and Industrial application of lasers.

(iv) Get adequate knowledge about holography & Medical applications of Lasers.

OUTCOME

The students should be able to:

(i) Specify and operate optical test instrumentation, for example, optical spectrum analyzers and laser beam profilers.

(ii) Align, maintain and operate optical components and support and positioning equipment.

(iii) Survey a laser work area, citing unsafe conditions present.

(iv) Gain knowledge about Holographic techniques and medical applications of laser.

UNIT I OPTICAL FIBERS AND THEIR PROPERTIES 9

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

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBERS 9

Fiber optic sensors - Fiber 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 III 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 -Types of lasers - Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

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 V HOLOGRAM AND MEDICAL APPLICATIONS **9**

Holography - Basic principle - Methods - Holographic interferometry and application,- Holographic components - Medical applications of lasers, laser and tissue interactive - Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, rigid and flexible endoscopes, gynecology and oncology.

L : 45 TOTAL : 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fiber Communication - Principles and Practice', Prentice Hall of India, 2005.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCES

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, 2004.
4. Monte Ross, 'Laser Applications', McGraw Hill, 2004.

EE2752 NEURAL NETWORK AND FUZZY LOGIC CONTROL

3 CREDITS

GOAL

To impart knowledge on various architectures of neural networks and Fuzzy logic controller.

OBJECTIVES

The course will enable the students to:

(i) Gain knowledge on the basic concepts of artificial neuron and their architecture

(ii) Gain knowledge on feedback networks and various applications of Neuro controller

(iii) Acquire knowledge about fuzzy sets and rules.

(iv) Get adequate knowledge about optimization membership function and genetic Algorithm

(v) Acquire adequate knowledge about the applications of fuzzy logic controller and basics of neuro fuzzy controller.

OUTCOME

The students should be able to:

(i) Specify the training rules and techniques for Artificial neurons.

(ii) Design feedback networks and recurrent networks with the help of application.

(iii) Define the fuzzy system with fuzzy sets.

(iv) Specify mathematical background for carrying out the optimization associated with neural network learning.

(v) Apply set of rules for applications

UNIT I ARCHITECTURES **9**

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

UNIT II NEURAL NETWORKS FOR CONTROL **9**

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

UNIT III FUZZY SYSTEMS **9**

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

UNIT IV FUZZY LOGIC CONTROL **9**

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

UNIT V 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

REFERENCES

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.

EE2753 RENEWABLE ENERGY SYSTEMS

3 CREDITS

PREREQUISITE

EE2502 - Transmission & Distribution

EE2601 - Power System Analysis

GOAL

To provide the knowledge about renewable energy systems

OBJECTIVES

The course will enable the students :

(i) To learn the types of renewable energy sources

(ii) To study the application of electrical machines in renewable energy conversion

(iii) To study the application of semi conductor devices in renewable energy conversion

(iv) To analyze the grid integrated renewable energy.

(v) To introduce the hybrid renewable energy systems

OUTCOME

The students should be able to:

(i) Understand the behavior of different renewable energy sources.

(ii) Study the Roll of electrical machines in renewable energy conversion.

(iii) Design the converters for renewable energy conversion.

(iv) Estimate the various parameters in the grid integrated system.

(v) Understand the application of hybrid renewable energy systems.

UNIT I INTRODUCTION **9**

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION **9**

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS **9**

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection Of inverter, battery sizing, array sizing Wind: three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS **9**

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG and SCIG Based WECS-Grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS **9**

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV-Maximum Power Point Tracking (MPPT).

TOTAL : 45

TEXT BOOKS

1. M. Godoy Simões, Felix A. Farret, 'Renewable Energy Systems: Design and Analysis With Induction Generators' - 2004
2. William H. Kemp, 'The renewable energy handbook: a guide to rural independence, off-grid and sustainable living' - 2005.
3. Renewable Energy Systems, 1st Edition, H Lund , 5 Sep 2009Academic Press

REFERENCES

1. Rashid .M. H "power electronics Hand book", Academic press, Nov 8, 2006.
2. Rai, G. D., Solar Energy Utilization, Delhi, India: Khanna Publishers, 2005
3. Gary L. Johnson. WIND ENERGY SYSTEMS. book, Prentice Hall Inc., ENGLAND cliffs, 2001.

EE2851 EMBEDDED SYSTEM DESIGN

3 CREDITS

PREREQUISITE

EE2404 - Digital Logic Circuits

EE2604 - Microprocessor & Microcontroller

GOAL

To provide the functional building blocks of an embedded for developing a real time system application.

OBJECTIVES

The course will enable the students to:

(i) Know the features that build an embedded system.

(ii) Get adequate knowledge about the interaction of various components within an embedded system

(iii) Get adequate knowledge about interfacing process

(iv) Get adequate knowledge of writing efficient programs on processor

(v) Acquire knowledge about RTOS.

OUTCOME

The students should be able to:

(i) Solve and design the real time embedded products

(ii) Solve the embedded products by using various parameters

(iii) Gain knowledge about various port devices

(iv) Solve competitive embedded programs using C

(v) Gain knowledge about the software in embedded system

UNIT I 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 II 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 III 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 IV 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 V 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.

REFERENCES

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

EI2861 BIOMEDICAL INSTRUMENTATION

3 CREDITS

PREREQUISITE

EE2304 - Measurement & Instrumentation

GOAL

To provide knowledge about the concept of different biomedical instruments & application

OBJECTIVES

The course will enable the students to:

(i) Acquire knowledge about physiology and transducer

(ii) Acquire knowledge about electro physiological measurements.

(iii) Acquire knowledge of non-electrical parameter measurement

(iv) Get knowledge of medical imaging and PMS

(v) Know about assisting & therapeutic equipment.

OUTCOME

The students should be able to:

(i) Gain knowledge about human nervous system, cardio pulmonary system..

(ii) Acquire knowledge about transducer & components of biomedical system

(iii) Gain knowledge about EEG, ECG, EMG etc.

(iv) Gain knowledge about parameter.

(v) Gain knowledge about diff.imaging techniques.

(vi) Gain knowledge about the equipment.

UNIT I PHYSIOLOGY AND TRANSDUCERS **9**

Cell and its structure - Action and resting - Potential propagation of action potential - Sodium pump - Nervous system - CNS - PNS - Nerve cell - Synapse - Cardio pulmonary system - Physiology of heart and lungs - Circulation and respiration - Transducers - Different types - Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers - Selection criteria.

Basic components of a biomedical system - Electrodes - Micro, needle and surface electrodes - Amplifiers - Preamplifiers, differential amplifiers, chopper amplifiers - Isolation amplifier.

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENTS 9

ECG - EEG - EMG - ERG - Lead systems and recording methods - Typical waveforms.

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure - Cardiac output - Cardiac rate - Heart sound - Respiratory rate - Gas volume - Flow rate of Co2, O2 in exhaust air - pH of blood, ESR, GSR measurements - Plethysmography.

UNIT IV MEDICAL IMAGING AND PMS 9

X-ray machine - Radio graphic and fluoroscopic techniques - Computer tomography - MRI - Ultrasonography - Endoscopy - Thermography - Different types of biotelemetry systems and patient monitoring - Electrical safety.

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dializers.

L : 45 TOTAL : 45

TEXT BOOKS

1. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.
2. R.S.Khandpur, 'Hand book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.

REFERENCES

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.
5. S.K. Gupta, 'Introduction to Medical Electronics', Bharathi Bhavan, Patna, 1969.

EE2852 POWER QUALITY

3 CREDITS

PREREQUISITE

EE2601 - Power System Analysis

EE2702 -Power System Operation & Control

MA 2301 - Engineering Maths - III

GOAL

To study the various issues affecting Power Quality, their production, monitoring and suppression. This includes studying the production of voltages sags, over voltages and harmonics and methods of control and to various methods of power quality monitoring.

OBJECTIVES

The course will enable the students to:

(i) Understand the concept of power quality involved terms and definitions

(ii) To study and understand the concept of over voltages and the mitigation methods along with PSCAD and EMTP

(iii) Understand various types of sources and control techniques of voltage sags.

(iv) Understand various types of sources and control techniques of harmonics.

(v) Acquire knowledge power quality monitoring.

OUTCOME

The students should be able to:

(i) Gain knowledge about over voltages and the mitigation methods using PSCAD and EMTP

(ii) Gain knowledge about various types of sources and control techniques of harmonics.

(iii) Gain knowledge about power quality monitoring

(iv) Gain knowledge about various types of sources and control techniques of harmonics.

UNIT I INTRODUCTION TO POWER QUALITY 3

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 II VOLTAGE SAGS AND INTERRUPTIONS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVERVOLTAGES **10**

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners - Lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS **12**

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING **13**

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L : 45 TOTAL : 45

REFERENCES

1. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCAD User Manual.

EE2853 VLSI DESIGN

3 CREDITS

PREREQUISITE

EE2503 - Linear Integrated Circuits

EE2404 - Digital Logic Circuits

EE2303 - Electronic Circuits

GOAL

To provide knowledge about the basics of VLSI design and the techniques available in it.

OBJECTIVES

The course will enable the students to:

(i) Get an idea about the working and fabrication of different types of MOS transistors.

(ii) Make students familiar with λ based rules, stick diagrams and construction of inverter and other circuits.And also familiarize them with different types of logics.

(iii) Get exposed to subsystem design and its layout

(iv) Familiarize the students with nMOS PLA, PLD and FPGA.

(v) Introduce to VHDL programming and system Design

OUTCOME

The students should be able to:

(i) Understand the theory and working of different types of MOS transistors.

(ii) Construct proper ratio inverter and other basic circuits in NMOS and CMOS logic with stick diagrams.

(iii) Build subsystems using different types of logic

(iv) Design and Construct Regular array based structures and Combinational elements.

(v) Gain VHDL programming skill and write test benches and programs for system design.

UNIT I 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 II NMOS & CMOS INVERTER AND GATES 9

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

UNIT III 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 IV DESIGN OF COMBINATIONAL ELEMENTS & REGULAR ARRAY LOGIC 9

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

UNIT V VHDL PROGRAMMING 9

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

L : 45 TOTAL : 45

TEXT BOOKS

1. D.A.Pucknell,K.Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall of India, New Delhi, 2008.
2. N.H.Weste, 'Principles of CMOS VLSI Design', 2nd edition,Pearson Education, India, 2005.
3. Zainalatsedin Navabi, 'VHDL Analysis and Modeling of Digital Systems', 3rd Edition Tata McGraw Hill, 2008.

REFERENCES

1. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 1990.
2. Douglas Perry, 'VHDL Programming By Example', Tata McGraw Hill, 3rd Edition.
3. Charles Hurth, 'Fundamentals of Logic Design', Jaico Publishing House, 1992.
4. C.Roth,"Digital System Design using VHDL",2006
5. G. Keiser, 'Optical Fiber Communication', McGraw Hill, 2006.
6. Mr. Gupta, 'Fiber Optics Communication', Prentice Hall of India, 2004.

MG2002 TOTAL QUALITY MANAGEMENT

3 CREDITS

GOAL

To understand the various aspects related to quality and to implement Total Quality Management practices in an organization.

OBJECTIVES

The course will enable the students:

(i) To gain knowledge about the basic principles and concepts of total quality management.

(ii) To gain adequate knowledge about statistical process control.

(iii) To familiarize with TQM tools Benchmarking, QFD and FMEA.

(iv) To familiarize the students with ISO standards and Quality auditing.

OUTCOME

The students should be able to:

(i) Understand the basic principles and concepts of total quality management.

(ii) Understand the statistical process control.

(iii) Apply TQM tools such as Benchmarking, QFD and FMEA.

(iv) To identify the ISO standards for quality auditing.

UNIT I 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 II 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 III 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 IV 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 V QUALITY SYSTEMS **9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 - Concept, Requirements and Benefits.

L : 45 TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2004.

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition),South-Western (Thomson Learning), 2002.
2. Feigenbaum.A.V. 'Total Quality Management', McGraw Hill, 2004.
3. Oakland.J.S. 'Total Quality Management Butterworth', Heinemann Ltd., Oxford. 2005.
4. Narayana V. and Sreenivasan, N.S.Quality Management - Concepts and Tasks, New Age International 2006.
5. Zeiri. 'Total Quality Management for Engineers'Wood Head Publishers, 2004.

MG2003 ENTREPRENEURSHIP DEVELOPMENT

3 CREDITS

GOAL

To inspire every student to become a successful entrepreneur.

OBJECTIVES

The course will enable the students to:

(i) Understand the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.

(ii) Develop entrepreneurship by accelerating growth strategies, implementation of corrective measures, understanding of government policies and all the other needs to provide support for an entrepreneur will be studied.

OUTCOME

The students should be able to:

(i) Implement entrepreneurship by basic concept and theoretical understanding of economic growth evolution of entrepreneurship and barriers.

(ii) Get equipped with motivational factor such as theories of motivation, training ,self rating , business games and so on so has to aspire to entrepreneur in future.

UNIT I ENTREPRENEURSHIP **9**

Entrepreneur - Types of Entrepreneurs - Difference between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

UNIT II MOTIVATION **9**

Major Motives Influencing an Entrepreneur - Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test - Stress management, Entrepreneurship Development Programs - Need, Objectives.

UNIT III BUSINESS **9**

Small Enterprises - Definition, Classification - Characteristics, Ownership Structures - Project Formulation - Steps involved in setting up a Business - identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment - Preparation of Preliminary Project Reports - Project Appraisal - Sources of Information - Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING **9**

Need - Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM - Tax aspects for Entrepreneurship Development

UNIT V SUPPORT TO ENTREPRENEURS **9**

Sickness in small Business - Concept, Magnitude, causes and consequences, Corrective Measures - Government Policy for Small Scale Enterprises - Growth Strategies in small industry - Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

L : 45 TOTAL : 45

TEXT BOOKS

1. S.S.Khanka 'Entrepreneurial Development' S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Hisrich R D and Peters M P, 'Entrepreneurship' 5th Edition Tata McGraw-Hill, 2006. 6th Edition

REFERENCES

1. Rabindra N. Kanungo 'Entrepreneurship and innovation', Sage Publications, New Delhi, 2002.
2. EDII 'Faulty and External Experts - A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development' Institute of India, Ahmadabad, 2003.

EE2854 POWER SYTEMS AND SMART GRID

3 CREDITS

PREREQUISITE

EE 2601 - Power System Analysis

EE 2502 - Transmission and Distribution

EE 2801 - Electrical Energy Utilization and Conservation

EE 2702 - Power System Operation and Control

GOAL

The first objective is to provide the students a systems perspective of modern electricity markets and a systems approach to address various issues faced by the electricity sector. The second objective is to present the student a vision of how Smart Grid will transform the current electricity grid to a reliable and sustainable modern energy system.

OBJECTIVES

The course will enable the students to:

(i) Understand the structure of an electricity market in either regulated or deregulated market conditions.

(ii) Understand the impacts of renewable resources to the grid and the various issues associated with integrating such resources to the grid.

(iii) Evaluate various investment options (e.g. generation capacities ,transmission, renewable , demand-side resources, etc) in electricity markets.

(iv) Understand the concepts and principles of Smart Grid, technology enabling ,and demand participation.

OUTCOME

The students should be able to:

(i) Gain knowledge about the economic fundamentals of power systems and electricity markets.

(ii) Understand the concepts of various components of Smart Grid, and their impacts on the energy industry, including renewable integration, demand side management, and greenhouse gas (GHG) emissions reductions.

(iii) Gain knowledge about the characteristics of smart grids

(iv) Gain knowledge about the basic elements and desirable traits of power grid

(v) Gain adequate knowledge about desirable features of smart grid

UNIT I SUPPLY SIDE AND DEMAND SIDE OF ELECTRICITY 10

Basics of electricity- Fossil fuel and hydro power plants- Renewable and alternative energy- Supply curve- Load characteristics- Load curve and load duration curve- Demand side management- Plug-in hybrid vehicles and smart appliances

UNIT II TRANSMISSION AND DISTRIBUTION NETWORKS 8

Physical laws of electricity; AC vs. DC Powerflow- Optimal power flow and unit commitment models- Distribution network basics.

UNIT III BASIC ELEMENTS AND DESIRABLE TRAITS OF SMART GRID 9

The origin of power grid - dependency on power grid - desirable features of power grid-reliability - security -economic -efficiency -environmental friendly - safety.

UNIT IV KEY CHARACTERISTICS OF SMART GRID 9

Demand-side participation- Impacts of Smart Grid on reliability- Impacts of Smart Grid on air pollutant emissions reduction.

UNIT V ISSUES RELATED TO SMART GRID 9

Communication and sensing in a smart grid- smart grid threats-vulnerabilities-cyber security strategies.

L : 45 TOTAL : 45

TEXT BOOKS

1. D. S. Kirschen and G Strbac, 'Fundamentals of Power System Economics'.Reprinted edition.
2. John Wiley & Sons Ltd. 2009
3. G. M. Masters ,'Renewable and Efficient Electric Power Systems' John Wiley & Sons, Inc. 2004.

REFERENCES

1. S.Stoft, 'Power System Economics: Designing Markets for Electricity', Wiley-Interscience, 2002.
2. A.Mazer, 'Electric Power Planning for Regulated and Deregulated Markets', John Wiley & Sons, Inc, 2007.