VR10
Academic Regulations
&
Syllabus

For

4 Year B. Tech EEE Degree Course

(Semester System)

w. e. f 2010 – 2011

DEPARTMENT OF

ELECTRICAL & ELECTRONICS ENGINEERING

VELAGAPUDI RAMAKRISHNA

SIDDHARTHA ENGINEERING COLLEGE

(AUTONOMOUS)

(Sponsored by Siddhartha Academy of General &Technical Education)

VIJAYAWADA-520 007

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE

(Autonomous)
Kanuru, Vijayawada – 520 007
(Approved by AICTE, Accredited by NBA, and ISO 9001: 2008 Certified)
(Affiliated to Jawaharlal Nehru Technological University Kakinada)

Academic Regulations for B.Tech () w.e.f: 2010-2011
(Common to all branches)

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1. INTRODUCTION

Academic Programmes of the College are governed by rules and regulations as approved by the Academic Council, which is the highest Academic body of the College. These academic rules and regulations are effective from the academic year 2010-11 for students admitted into four year undergraduate programme offered by the college leading to Bachelor of Technology (B.Tech) in the disciplines viz., Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Information Technology, and Mechanical Engineering.

2. PROGRAMMES OFFERED

Currently, the college is offering B.Tech degree programmes in the following disciplines:

1. **Civil Engineering (CE)**
2. **Computer Science and Engineering (CS)**
3. **Electronics and Communication Engineering (EC)**
4. **Electrical and Electronics Engineering (EE)**
5. **Electronics and Instrumentation Engineering (EI)**
6. **Information Technology (IT)**
7. **Mechanical Engineering (ME)**

3. DURATION OF THE PROGRAMME

The duration of the programme is four academic years consisting of eight semesters. A student is permitted to complete the B.Tech Programme in a stipulated time frame of 8 years from the date of joining. Students joining the B.Tech Programme in the third semester directly through lateral Entry Scheme (LES) shall have to complete the programme in a stipulated time frame of 6 years from the date of joining. Otherwise they shall forfeit their seat in B.Tech Programme and their admission shall stand cancelled.

4. MINIMUM INSTRUCTION DAYS

Each semester, normally consists of a minimum of 90 instruction days with about 30 to 35 contact periods per week.

5. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into engineering programmes shall be as mentioned below:

- The Candidate shall be Indian National.
- The Candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.
- Seats in each programme in the College are classified into CATEGORY-A (70% of intake), and CATEGORY-B (30% of intake) besides Lateral Entry.

5.1 CATEGORY – A Seats :

- These seats will be filled by the Convener, EAMCET Admissions.

5.2 CATEGORY – B Seats :

- These seats will be filled by the College as per the guidelines of Andhra Pradesh State Council of Higher Education.

5.3 CATEGORY - Lateral Entry Seats:

- 10% of the candidates shall be admitted into the Third semester directly based on the rank secured by the candidate in Engineering Common Entrance Test (ECET (FDH)) in accordance with the instructions received from the Convener, ECET and Government of Andhra Pradesh.

6. PROGRAMME STRUCTURE

Every course of the B.Tech programme will be placed in one of the categories listed in Table 1.

Table 1: Categories of Courses

Sl.No	Courses	Weightage
1.	Basic Science Core Courses	**10-15%**
2.	Basic Engineering Science Core Courses	**12-20%**
3.	Humanities and Social Science Core Courses	**2-5%**
4.	Professional Courses and Electives	**55-65%**
5.	Major Project	**4-6%**
6.	Mandatory learning courses	**2-3%**
7	**Personality Development Courses:-** One personality development course in each semester of 3rd year is offered. Each course carries one credit. Students have to participate and achieve satisfactory level of performance in these courses.	**1%**
8	**Student Practice Courses:** Student practice courses are offered from 2nd year onwards. Each course carries one credit. Student will have to participate and achieve satisfactory level of performance in order to earn the credit in each course. Students have to acquire a minimum of 2 credits before completion of 6th semester of B.Tech. • **Industry practice :-** Student should undergo Summer training for a minimum of 2weeks. • **Self learning:-** Student should prepare and submit a report on a totally new topic relevant to the programme. • **Co-curricular participation:-** Student should have participated in Technical Quizzes / Student paper contest / Seminars / Conferences etc., • **Extra- curricular participation:-** Student should have participated in Sports & Games / Cultural activities / Drawing / Photography etc. • **National Service Scheme (NSS):-** Student should have enrolled as a member of NSS at least for one semester. • **National Cadet Corps (NCC):-** Cadet of NCC for a minimum period of one year.	**1%**

6.1 Course Code and Course Numbering Scheme

Course Code consists of six characters in which the first two are alphabets and rest are numerals. First two characters are described in Table 2.

Table 2: First and Second Character description

First Two Characters	Name of the Department
FY	First and Second semesters of all Departments
CE	Civil Engineering Department
CS	Computer Science and Engineering Department
EC	Electronics & Communication Engineering Department
EE	Electrical & Electronics Engineering Department
EI	Electronics and Instrumentation Engineering Department
IT	Information Technology Department
ME	Mechanical Engineering Department

Third character represents the semester in which the Course is offered as mentioned in Table No. 3. Fourth character represents the syllabus version number of the course.

Table 3: Third Character description

THIRD CHARACTER	DESCRIPTION
1	First Semester
2	Second Semester
3	Third Semester
4	Fourth Semester
5	Fifth Semester
6	Sixth Semester
7	Seventh Semester
8	Eight Semester

Fifth character represents course type, as per Table No. 4

Table 4: Course type description

FIFTH CHARACTER	DESCRIPTION
0	Theory course
5	Lab course

Sixth character represents course number as described in Figure 1 below. However, few courses are given distinct codes like FY1002C (Engineering Chemistry).
For example, **FY 1005** course, the course is offered in the first semester (**1**), the course syllabus version number is (**0**), the course is of theory type (**0**) and the course number in that semester (**5**).

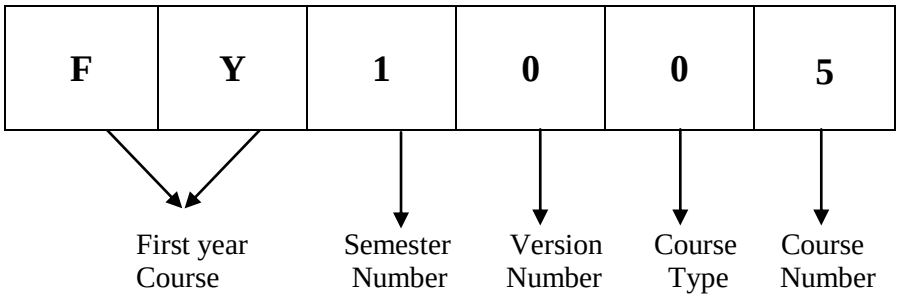

Figure 1: Course code description for I & II Semesters

For example, **CS 4051** course, the course is offered in Computer Science and Engineering Department (**CS**) offered in the fourth semester (**4**), the course syllabus revision number (**0**), the course is of lab type (**5**) and the course number is (**1**), as given in figure.2 below.

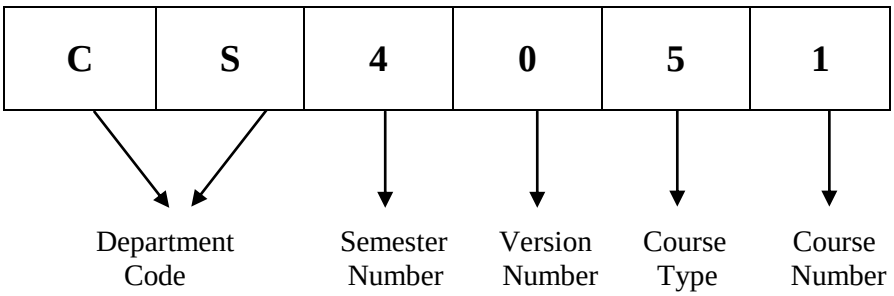

Figure 2: Course code description from III Semester onwards

6.2 Scheme of Instruction for 1st , 2nd, 3rd and 4th Years

- The scheme of instruction and syllabi of all B.Tech programmes are given separately.

6.3 Contact Hours and Credits

The Course Credits are broadly fixed based on the following norms.

- Lectures – One Lecture period per week is assigned one credit.
- Tutorials - Two tutorial periods per week are assigned one credit.
- Practical – 2 periods per week is assigned one credit.
- Practice course/ Personality development course and Mini project /Term Paper shall have 1 credit each.
- Major project shall have 12 credits.
- However, some courses are prescribed with fixed number of credits depending on the complexity of the subject and relative importance.

6.4 Theory / Tutorial classes

Each course is prescribed with fixed number of lecture periods per week. During lecture periods, the course instructor shall deal with the concepts of the course. For certain courses, tutorial periods are prescribed in order to give exercises to the students and to closely monitor their learning ability and achievement.

6.5 Laboratory / Drawing Courses

A minimum prescribed number of experiments / drawings / jobs / programs have to be performed by the students, who shall complete these in all respects and get each experiment evaluated by teacher concerned and certified by the Head of the Department concerned at the end of the semester.

6.6 Programme Credits

- Each discipline of the B.Tech programme is designed to have a total of 210(206+4) credits, and the student shall have to complete the courses and earn credits as per the requirements for award of the degree.
- Students joining the undergraduate programme in the third semester directly through Lateral Entry Scheme (LES) shall have to complete the courses, excluding first year courses and earn credits as per the requirements for award of the degree.

7. MEDIUM OF INSTRUCTION

The medium of instruction and examination is English.

8. SYLLABUS

As approved by the BOS concerned and the Academic Council.

9. ELIGIBILITY REQUIREMENT FOR APPEARING AT SEMESTER END EXAMINATION AND CONDONATION

9.1 Regular course of study means a minimum average attendance of 75% in all the courses computed by totaling the number of periods of lectures, tutorials, drawing, practical, personality development courses and project work as the case may be, held in every course as the denominator and the total number of periods attended by the student in all the courses put together as the numerator.

9.2 Condonation of shortage in attendance may be recommended by respective Heads of Departments on genuine medical grounds, provided the student puts in at least 65% attendance as calculated above and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

9.3 Students, having shortage of attendance, shall have to pay requisite fee towards condonation.

9.4 Minimum of 50% aggregate marks must be secured by the candidates in the internal examinations conducted for theory, practice and lab courses, to be eligible to write semester end examinations. However, if the student is eligible for promotion based on the attendance, in case necessary, a shortage of internal marks up to a maximum of 10% may be condoned by the Principal based on the recommendations of the Heads of the Departments.

9.5 Students having shortage of internal marks up to a maximum of 10% shall have to pay requisite fee towards condonation.

9.6 A student, who does not satisfy the attendance and/or internal marks requirement, shall have to repeat that semester.

9.7 Eligible candidate who failed to register for all papers for the semester-end examinations shall not be permitted to continue the subsequent semester, and has to repeat the semester for which he/she has not registered for semester end examinations.

10. EXAMINATIONS AND SCHEME OF EVALUATION

10.1 INTERNAL EXAMINATIONS:

10.1.1 Theory Courses

- Each course is evaluated for **30** marks (a+b+c+d).

a) **5** marks in each theory course shall be given for those students who put in attendance in a graded manner as given in Table 5.

Table 5: Attendance based marks system

S. No	Attendance Range	Marks Awarded
1	Attendance of 75% and above but less than 80%	3 Marks
2	Attendance of 80% and above but less than 90%	4 Marks
3	Attendance of 90% and above	5 Marks

b) Two midterm examinations each for 10 marks will be conducted for 1 hour duration in every theory course in a semester. The midterm marks shall be awarded giving a weightage of $2/3^{rd}$ in the midterm examination in which the student scores more marks and $1/3^{rd}$ for the midterm examination in which the student scores less marks.

c) Two assignment tests each for 10 marks are to be conducted for 45 minutes duration in every department for each subject. Both the tests will be given due weightage while finalizing the semester performance. The weightage to be followed is 2/3 of the best and 1/3 of the next together.

d) 5 marks are allocated for home assignment/projects. Students shall be informed regarding the home assignment/project during first week of semester and they have to submit the completed assignment on or before 12^{th} week of the semester.

10.1.2 5 Marks shall be given to those students who put in attendance in a graded manner as given in Table 5 for Engineering Graphics Course, Term paper & Mini Project.

10.1.3 Engineering Graphics:

For the subjects having drawing such as Engineering Graphics the distribution is as given below:

Table 6: Distribution of Marks

Sl.No.	Criteria	Marks
1	Day to Day work	15
2	Internal Examination	10

10.1.4 Laboratory Courses:

For Laboratory courses there shall be continuous evaluation during the semester for 25 internal marks. The distribution of internal marks is given below:

Table7 : Distribution of Marks

Sl.No.	Criteria	Marks
1	Day to Day work	10
2	Record	05
3	Internal Examination	10

10.1.5 Term Paper/Mini Project:

The distribution of internal marks for Term Paper / Mini Project is given below:

Table 8: Distribution of Marks

Sl.No.	Criteria	Marks
1	Report	10
2	Seminar & Viva	10

10.1.6 Major Project:

The internal evaluation for 50 marks allocated for the project work shall be on the basis of two seminars & Viva - Voce examination by each student on the topic of his/her project and evaluated by Project Review committee. The Project Review committee consists of Head of Department, respective internal guide and three senior faculty members of the department. The distribution of marks is as follows.

Table 9: Distribution of Marks

Sl.No.	Criteria	Marks
1	Two Seminars & Viva-Voce	20+20
2	Day to Day Assessment	10

10.2 SEMESTER END EXAMINATIONS

10.2.1 Theory Courses: 70 marks

- The Semester end examinations shall be conducted for 3 hours duration at the end of the semester. The question paper shall be given in the following pattern :
  - **Part–A:** Shall contain 10 questions of one mark each. A minimum of two Questions will be given from each unit of the syllabus out of four units.
  - **Part–B:** There shall be two questions from each unit with internal choice. Each question carries 15 marks. Each course shall consist of four units of syllabus.

10.2.2 Engineering Graphics:

- The Semester end drawing examinations shall be conducted for 3 hours duration at the end of the semester. The question paper shall be given in the following pattern :
  - **Part–A:** Shall contain 4 freehand sketch type questions of 2.5 marks each. One Question will be given from each unit of the syllabus out of four units.
  - **Part–B:** There shall be two questions from each unit with internal choice. Each question carries 15 marks. Each course shall consist of four units of syllabus.

10.2.3 Lab Courses (Practical / Practice / Workshop): 50 marks

- **35** marks are allotted for experiments/job works & **10** marks are allotted for viva-voce examination and 5 marks for record.
- Each Semester-end Lab Examination shall be evaluated by an External Examiner along with an Internal Examiner. The average of the marks awarded by Internal and External Examiners shall be taken into consideration.

10.2.4 Term Paper/ Mini Project:

The distribution of Semester end examination marks for Term Paper/Mini Project are given below.

Table 10: Distribution of Marks

Sl.No.	Criteria	Marks
1	Report	40
2	Seminar & Viva	10

10.2.5 Major Project:

The semester end examination for project work evaluated for 100 marks shall be conducted by a committee. The committee consists of an External examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the VIII Semester. Major project shall be evaluated by an External examiner, Head of the Department and Supervisor of the Project with a weightage of 50%, 25% & 25% respectively. The evaluation of 100% marks is distributed as given below:

Table 11: Distribution of Marks

Sl.No.	Criteria	Marks
1	Report	70
2	Presentation & Viva	30

11. CONDITIONS FOR PASS AND AWARD OF CREDITS FOR A COURSE

11.1 Conditions for Pass and award of Grades & Credits:

a) A candidate shall be declared to have passed in individual theory/drawing course if he/she secures a minimum of 40% aggregate marks (Internal & semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.

b) A candidate shall be declared to have passed in individual lab/project course if he/she secures a minimum of 50% aggregate marks (Internal & semester end examination marks put together), subject to a minimum of 40% marks in semester end examination.

c) The student has to pass the failed course by appearing the supplementary examination as per the requirement for the award of degree.

d) On passing a course of a programme, the student shall earn assigned credits in that Course.

11.2 Method of Awarding Letter Grades and Grade Points for a Course.

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table 12: Grading System for B.Tech Programme

Theory/Drawing	Lab/Project	Grade Points	Letter Grade
85-100%	85-100%	10	Ex
75-84%	75-84%	9	A+
70-74%	70-74%	8	A
65-69%	65-69%	7	B+
60-64%	60-64%	6	B
50-59%	55-59%	5	C
40-49%	50-54%	4	D
< 40%	< 50%	0	F (Fail)

11.3 Calculation of Semester Grade Points Average (SGPA)* for semester

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\sum(CR * GP)}{\sum CR}$$ (For all courses passed in semester)

Where CR= Credits of a course
GP = Grade points awarded for a course
* SGPA is calculated for the candidates who passed all the courses in that semester.

11.4 Calculation of Cumulative Grade Point Average (CGPA) and Award of Division for Entire Programme.

The CGPA is calculated as below:

$$CGPA = \frac{\sum(CR * GP)}{\sum CR}$$ (For entire programme)

Where CR= Credits of a course
GP = Grade points awarded for a course

Table 13: Award of Divisions

CGPA	DIVISION
≥8	First Class with distinction
≥6 - <8	First Class
≥5 - <6	Second Class
≥4 - <5	Pass Class
<4	Fail

11.5 Transitory Regulations

A candidate, who is detained or discontinued in the semester, on readmission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which he joins subsequently. However, exemption will be given to those candidates who have already passed in such courses, in the earlier semester(s) as approved by Board of Studies and Academic Council.

11.6 Conditions for Promotion

a) A student shall be eligible for promotion to next Semester of B.Tech programme, if he/she satisfies the conditions as stipulated in Regulation 9.

b) Further a student shall be eligible for promotion to V / VII Semesters of B.Tech programme, if he/she acquires the minimum number of credits as given below.

11.6.1 Promotion to V Semester

A Student shall be promoted from semester – IV to semester – V only if he fulfills the academic requirements of 38 credits (up to III semester) from the following Examinations, whether the candidate takes the examinations or not.

a) One Regular and Two subsequent Supplementary Examinations of Semester – I
b) One Regular and One subsequent Supplementary Examinations of Semester – II
c) One Regular Examination of Semester – III

11.6.2 Promotion to VII Semester

i) For Four Year B.Tech Course Candidates

A Student shall be promoted from Semester – VI to Semester - VII only if he fulfills the academic requirements of 64 credits (up to V semester) from the following Examinations, whether the candidate takes the examination or not.

a) One Regular and Four subsequent Supplementary Examinations of Semester – I
b) One Regular and Three subsequent Supplementary Examinations of Semester – II
c) One Regular and Two subsequent Supplementary Examinations of Semester – III
d) One Regular and One subsequent Supplementary Examination of Semester – IV
e) One Regular Examination of Semester – V

ii) For Lateral Entry candidates:

A Student shall be promoted from Semester – VI to Semester - VII only if he fulfills the academic requirements of 39 credits from the following Examinations, whether the candidate takes the examination or not.

a) One Regular and Two subsequent Supplementary Examinations of Semester – III
b) One Regular and One subsequent Supplementary Examination of Semester – IV
c) One Regular Examination of Semester – V

Table 14: Promotion Criteria

For admission into	Minimum Credits Required	
	For Four year B.Tech Candidates	For lateral entry candidates
V Semester	38 out of 76	-
VII Semester	64 out of 128	39 out of 78

11.7. Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the candidates will be issued after completion of the four year B.Tech Programme.

12. SUPPLEMENTARY EXAMINATIONS

- Supplementary examinations will be conducted along with regular semester end examinations.

- Semester end supplementary Examinations shall be conducted in subjects of each semester four times after the conduct of the last set of regular examinations (i.e. IV/IV B.Tech., Second Semester Examinations) under the present regulation.

Thereafter supplementary examinations will be conducted in the equivalent courses as prescribed by concerned BOS.

13. REVALUATION

- As per the notification issued by the Chief Controller of Examinations, the students can submit the applications for revaluation, along with the fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with marks obtained.
- The Controller of Examinations shall arrange for revaluation of those answer script(s).
- A new external examiner, other than the first examiner, shall revaluate the answer script(s).
- Better marks of the two will be taken into consideration.

14. READMISSION CRITERIA

A candidate, who is detained in a semester due to lack of attendance/marks/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of Rs. 1,000/-

15. BREAK IN STUDY

Student, who discontinues the studies for what so ever may be the reason, can get readmission into appropriate semester of B.Tech programme after break-in study only with the prior permission of the Principal of the College provided such candidate shall follow the transitory regulations applicable to such batch in which he/she joins. An administrative fee of Rs. 2000/- per each year of break in study in addition to the prescribed tuition and special fee has to be paid by the candidate to condone his/her break in study.

16. ELIGIBILITY FOR AWARD OF B.TECH. DEGREE

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

- A Regular student (four year programme) should register himself for 210 Credits, the breakup for which is 206 Academic Credits and 4 for practice and personality development courses; out of which a student has to secure a minimum of 198 Academic credits and should obtain all the four credits pertaining to practice and personality development courses in order to become eligible for the award of B.Tech Degree.
- A Lateral Entry student should register himself for 160 Credits, the breakup for which is 156 Academic Credits and 4 for practice and personality development courses; out of which a student has to secure a minimum of 148 Academic credits and should obtain all the four credits pertaining to practice and personality development courses in order to become eligible for the award of B.Tech Degree.

However, it is mandatory for the students to pass all the laboratory courses.

17. BETTERMENT/IMPROVEMENT OF CUMULATIVE GRADE POINT AVERAGE

17.1 A candidate, after becoming eligible for the award of the Degree, may reappear for the external Examination in any of the theory courses as and when conducted, for the purpose of improving the aggregate and the class. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree subject to fulfillment of Regulation 3.

17.2 However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for Internal Examination or for Semester End Examinations in Practical courses (including Project Viva-voce) and also for Semester End Examinations evaluated internally for the purpose of improvement.

17.3 Modified Grade Cards & New Consolidated Grade Card will be issued after incorporating new Grades & Credits.

18. ADVANCED SUPPLIMENTARY EXAMINATION

Candidate(s), who failed in Theory or Lab courses of 4th year 2nd semester, can appear for advanced supplementary examination conducted within one month after declaration of the revaluation results. However, those candidates that fail in this advanced supplementary examinations of 4th year second semester shall appear for subsequent examination along with regular candidates in the examinations conducted at the end of the respective academic year during March/April.

19. CONDUCT AND DISCIPLINE

- Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.
- As per the order of Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is banned. Any form of ragging will be severely dealt with.
- The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.
  i. Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.
  ii. Willful damage or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens.

The following activities are not allowed within the campus

* Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
* Mutilation or unauthorized possession of library books.
* Noisy and unseemly behavior, disturbing studies of fellow students.
* Hacking computer systems (such as entering into other person's areas without prior permission, manipulation and/or damage of computer hardware and software or any other cyber crime etc.)
* Use cell phones in the campus.
* Plagiarism of any nature.
* Any other act of gross indiscipline as decided by the college from time to time.

- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debarment from a examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Principal, respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Principal for taking appropriate action.
- Unauthorized collection of money in any form is strictly prohibited.
- Detained and Break-in-Study candidates are allowed into the campus for academic purposes only with permission from Authorities.
- Misconduct committed by a student outside the college campus but having the effect of damaging, undermining & tarnishing the image & reputation of the institution will make the student concerned liable for disciplinary action commensurate with the nature & gravity of such misconduct.
- The Disciplinary Action Committee constituted by the Principal, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- "Grievance appeal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative /disciplinary matters.
- All the students must abide by the code and conduct rules of the college.

20. MALPRACTICES

- The Principal shall refer the cases of malpractices in internal assessment tests and Semester-End Examinations, to a Malpractice Enquiry Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students basing on the recommendations of the committee.
- Any action on the part of candidate at an examination trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing/keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

21. OTHER MATTERS

21.1 The physically challenged candidates who have availed additional examination time and a scribe during their Intermediate/EAMCET examinations will be given similar concessions on production of relevant proof/documents.

21.2 Students who are suffering from contagious diseases are not allowed to appear either internal or semester end examinations.

21.3 The students who participated in coaching/tournaments held at State/National /International levels through University / Indian Olympic Association during semester end external examination period will be promoted to subsequent semesters till the entire course is completed as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated 18-08-1994.

21.4 The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved in the Heads of the Departments Meetings, shall be reported to the academic council for ratification.

22. AMENDMENTS TO REGULATIONS

The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and/or syllabi.

Courses Distribution: Category wise

Year/ Semester	BS 10-15%	BES 12-20%	HU 2-5%	PC	EL	MP 4-6%	ML 2-3%	SP 1%	Total Credits
				55-65%					
I Year (Sem-I)	FY 1001 FY 1002C FY 1051C =09	FY 1003B FY 1004M FY 1005 FY 1052 FY 1053W =14	FY 1006 =2	---	---	---	---	---	25
I Year (Sem-II)	FY 2001 FY 2002P FY 2051P = 09	FY 2005 FY 2052 FY 2053G = 10	FY 2003E FY2004EN = 06	---	---	---	---	---	25
II Year (Sem-III)	EE 3001 =4	---	---	EE 3002 EE 3003 EE 3004 EE 3005 EE 3006 EE 3051 EE 3052 =22	---	---	---	----	26
II Year (Sem-IV)	EE 4001 =4	---	EE 4053 =2	EE 4002 EE 4003 EE 4004 EE 4005 EE 4051 EE 4052 =20	---	---	---	---	26
III Year (Sem-V)	---	---	---	EE 5001 EE 5002 EE 5004 EE 5005 EE 5006 EE 5051 EE 5052 =22	----	---	EE 5003 EE 5053 =4	---	26
III Year (Sem-VI)	---	EE 6005 =3	----	EE 6001 EE 6002 EE 6003 EE 6004 EE 6005 EE 6006 EE 6051 EE 6052 = 25	----	---	EE 6053 =1	---	26
IV Year (Sem-VII)	---	---	---	EE 7001 EE 7002 EE 7003 EE 7004 EE 7005 EE 7051 EE 7052 =18	EE 7006 =4	---	EE 7053 =1	---	26
IV Year (Sem-VIII)	---	---	---	EE 8001 EE 8051 =06	EE 8002 EE 8003 =08	EE 8052 =12	---	---	26
Total Credits	26 12.6%	27 13.1%	10 4.8%	113 60.6%	12	12 5.8%	06 2.9%	03*	206

ELECTRICAL & ELECTRONICS ENGINEERING DEPARTMENT
V.R.SIDDHARTHA ENGINEERING COLLEGE (AUTONOMOUS): VIJAYAWADA
SCHEME OF INSTRUCTIONS FOR 2010-2011 (AUTONOMOUS BATCH)

SEMESTER - I

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
FY 1001	Engineering Mathematics – I	4	1	-	4	30	70	100
FY 1002C	Engineering Chemistry	3	1	-	3	30	70	100
FY 1003B	Basics of Civil & Mechanical Engineering	4	-	-	4	30	70	100
FY 1004M	Mechanics for Engineers	4	1	-	4	30	70	100
FY 1005	Introduction to Computing	2	-	-	2	30	70	100
FY 1006	Professional Ethics	2	-	-	2	30	70	100
FY 1051C	Engineering Chemistry Lab	-	-	3	2	25	50	75
FY 1052	Basic Computing Lab	-	-	3	2	25	50	75
FY 1053W	Workshop practice	-	-	3	2	25	50	75
Total		**19**	**3**	**9**	**25**	**255**	**570**	**825**
		31						

SEMESTER II

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
FY 2001	Engineering Mathematics – II	4	1	-	4	30	70	100
FY 2002P	Engineering Physics	3	1	-	3	30	70	100
FY 2003E	Technical English & Communication Skills	2	-	2	3	30	70	100
FY 2004EN	Environmental Science	3	1	-	3	30	70	100
FY 2005	Programming in C	3	1	-	3	30	70	100
FY 2007	Engineering Graphics	2	-	6	5	30	70	100
FY 2051P	Engineering Physics Lab	-	-	3	2	25	50	75
FY 2052	C- Programming Lab	-	-	3	2	25	50	75
Total		**17**	**4**	**14**	**25**	**230**	**520**	**750**
		35						

SEMESTER – III

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE/EI/EC3001	Engineering Mathematics – III	4	1	-	4	30	70	100
EE3002	Electromagnetic Field Theory	3	1	-	3	30	70	100
EE/EI3003	Basic Electronic Devices and Circuits	4	-	-	4	30	70	100
EE3004	Network Analysis – I	4	1	-	4	30	70	100
EE/EI3005	Digital Electronics	4	-	-	4	30	70	100
EE3006	DC Machines	3	1	-	3	30	70	100
EE3051	Electrical Networks and Machines Lab – I	-	-	3	2	25	50	75
EE3052	Electronics Lab – I	-	-	3	2	25	50	75
Total		**22**	**04**	**6**	**26**	**230**	**520**	**750**
		32						

SEMESTER IV

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE/EI 4001	Engineering Mathematics – IV	4	1	-	4	30	70	100
EE4002	Analog Electronics – I	4	-	-	4	30	70	100
EE4003	Network Analysis – II	4	1	-	4	30	70	100
EE4004	Electrical Measurements	4	-	-	4	30	70	100
EE4005	Transformers and Induction Motors	4	1	-	4	30	70	100
EE4051	Electrical Networks and Machines Lab-II	-	-	3	2	25	50	75
EE4052	Electrical Measurements Lab	-	-	3	2	25	50	75
EE4053	Communication Skills Lab	-	-	3	2	75*	-	75
Total		**20**	**03**	**9**	**26**	**275**	**450**	**725**
		32						

*25 Marks for continuous assessment and 50 marks for final presentation evaluated internally.

SEMESTER V

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE/EI5001	Linear Control Systems	4	1	-	4	30	70	100
EE 5002	Analog Electronics – II	4	-	-	4	30	70	100
EE/EI/EC 5003	Engineering Economics & Management	3	-	-	3	30	70	100
EE5004	Microprocessors & Microcontrollers	4	-	-	4	30	70	100
EE5005	Generation of Electrical Power	3	1	-	3	30	70	100
EE5006	Synchronous and Special Machines	3	1	-	3	30	70	100
EE5051	AC Machines Laboratory	-	-	3	2	25	50	75
EE5052	Electronics Lab – II	-	-	3	2	25	50	75
EE5053	Electrical Workshop	-	-	2	1	75*	-	75
Total		**21**	**3**	**8**	**26**	**305**	**520**	**825**
		32						

* 25 Marks for continuous assessment and 50 marks for final presentation evaluated internally.

SEMESTER VI

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE/EC6001	Integrated Circuits & Applications	4	1	-	4	30	70	100
EE/EI6002	Fundamentals of Digital Signal Processing	4	-	-	4	30	70	100
EE6003	Switchgear & Protection	3	1	-	3	30	70	100
EE6004	Transmission & Distribution	3	1	-	3	30	70	100
EE6005	Data structures using C++	3	-	-	3	30	70	100
EE6006	Power Electronics	4	1	-	4	30	70	100
EE6051	Power Electronics Lab	-	-	3	2	25	50	75
EE6052	Control Systems & Microprocessors Lab	-	-	3	2	25	50	75
EE6053	Mini-project	-	1	-	1	75*	-	75
Total		**21**	**5**	**6**	**26**	**305**	**520**	**825**
		32						

* 25 Marks for continuous assessment and 50 Marks for final presentation assessed internally.

SEMESTER VII

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE7001	Utilization of Electrical Power	3	1	-	3	30	70	100
EE7002	High Voltage Engineering	3	-	-	3	30	70	100
EE7003	Power System Analysis	4	1	-	4	30	70	100
EE7004	Advanced Control Systems	4	-	-	4	30	70	100
EE7005	Industrial Drives	3	1	-	3	30	70	100
EE7006	Elective Course – I†	4	-	-	4	30	70	100
EE7051	C++ & DSP Lab	-	-	3	2	25	50	75
EE7052	Power Systems Lab	-	-	3	2	25	50	75
EE7053	Term Paper	-	1	-	1	75*	-	75
Total		**21**	**4**	**6**	**26**	**305**	**520**	**825**
		31						

* 25 Marks for continuous assessment and 50 Marks for final presentation assessed internally.

† Elective Course-I

- EE 7006/1: Database Management Systems
- EE 7006/2: HVDC Transmission
- EE 7006/3: Optimization Techniques
- EE 7006/4: Soft Computing
- EE 7006/5: Industry Open Slot

SEMESTER VIII

Code No.	Subject	Periods per week			Credits	Maximum Marks		Total Marks
		Lecture	Tutorial	Lab/ Practice		Internal	External	
EE8001	Power System Operation and Control	4	-	-	4	30	70	100
EE8002	Elective Course-II#	4	-	-	4	30	70	100
EE8003	Elective Course - III†	4	-	-	4	30	70	100
EE8051	Simulation of Electrical Systems Lab	-	-	3	2	25	50	75
EE8052	Project Work	2	6	10	12	50	100	150
Total		**14**	**6**	**13**	**26**	**165**	**360**	**525**
		33						

 # Elective Course-II

- EE8002/1: Energy Conservation and Audit
- EE8002/2: Non-Conventional Energy Sources
- EE8002/3: FACTS Controllers
- EE8002/4: Computer Networks
- EE8002/5: Industry Open Slot

† Elective Course –III

- EE8003/1: Computer Aided Power System Analysis
- EE8003/2: Electrical Machine Design
- EE8003/3: Electrical Distribution Systems
- EE8003/4: Computer Organization

FY 1001
ENGINEERING MATHEMATICS-I

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ Week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives: The study of the course provides an understanding of ordinary and partial differential equations and give different methods for solving them. Linear algebra in the course cover material which is essential to anyone who does mathematical computation in Engineering and sciences.

Learning Outcomes:

1. Upon completing this course students should be able to solve system of Linear equations, be familiar with properties of matrices, find the inverse, eigen values and eigen vectors and use them in diagonalization, reductive to quadratic form and identifying matrix of a quadratic form, understanding the concept of convergences and finding the sum of infinite series.
2. Upon completing this course students should be able to solve first order seperable and linear differential equations and use these methods to solve applied problems. Solve higher order constant linear coefficient and system of differential equations and use these methods to solve applied problems. Formation of Partial differential equations and solution to partial differential equations.

UNIT – I

Matrices: Rank of a matrix, Elementary transformations, Echelon-form of a matrix, normal form of a matrix, Inverse of a matrix by elementary transformations(Gauss – Jordan method). Solution of system of linear equations: Non homogeneous linear equations and homogeneous linear equations. Linear dependence and linear independence of vectors.
Characteristic equation – Eigen values – Eigen vectors – properties of Eigen values. Cayley-Hamilton theorem (without proof). Inverse of a matrix by using Cayley-Hamilton theorem.

UNIT – II

Reduction to diagonal form – Modal matrix orthogonal transformation. Reduction of quadratic form to canonical form by orthogonal transformations. Nature of a quadratic form – Hermitian and skew-Hermitian matrices.

SEQUENCES AND SERIES : Convergence of series – comparison test – D'Alemberts Ratio test – Cauchy's Root Test – Alternating series – Absolute convergence – Leibnitz's Rule.

UNIT – III

Ordinary differential equations – Formation – separable equations – exact equations – integrating factors – linear first order differential equations – Bernoulli's equation - orthogonal trajectories. Newtons Law of Cooling, Heat Flow - Linear equations of higher order with constant coefficients.

UNIT – IV

Linear dependence of solutions, method of variation of parameters – equations reducible to linear equations – Cauchy's homogeneous linear equation – Legendre's linear equation simultaneous linear equations with constant coefficients.

Partial Differential Equations : Formation of Partial Differential Equations, Solutions of a Partial Differential Equation – Equations solvable by direct integration – Linear Equation of First order.

Learning Resources:

Text Books:

- A text book of Higher Engineering Mathematics by Dr.B.S.Grewal, 40th Edition. (Prescribed), Khanna Publishers
- A Text book o Engineering Mathematics by N.P.Bali, Manish Goyal, Laxmi Publications(P) Limited.
- A text book of mathematics by B.V.Ramana, Tata MC Graw Hill.

Reference Books:

- Advanced Engineering Mathematics by Krezig., 8th Edition, John Wiley & Sons
- Advanced Engineering Mathematics by Peter.V.O.Neil, Thomson, Canada
- Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar, 3rd Edition - Narosa Publishers.

FY 1002C
ENGINEERING CHEMISTRY

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ Week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives: Basic engineering principles in engineering education are not totally independent and they go along with the principles of chemistry. It is a well-known fact that the application of principles of chemistry emerges into technology. Hence, a broad knowledge of chemistry is essential for the undergraduate students of engineering in any branch. The present syllabus is designed by keeping everything related to the role played by chemistry in the field of engineering.

Learning Outcomes: The objectives of this course will have the following outcomes:

1. Water being an important engineering material, its role in the industries and in particular boilers is to be thoroughly understood. The various boiler troubles encountered and the remedial measures will help the students especially when they want to set up an industry of their own. A lot of work is being done on purification of brackish water and hence one is supposed to be informed of the technology of purification of sea water.
2. Conducting polymers are replacing metals in the field of technology and hence it is essential to know the mechanism associated with conducting polymers.
3. Electrochemistry and electrochemical energy systems provide an insight into the electrical world that includes power generators, battery systems and electrical sensors that control various systems.
4. Corrosion, the global problem can well be understood so that the contribution of the undergraduate engineers in terms of protecting metals can always be enhanced in the field of Research and Development.
5. Any branch of engineering student requires analytical skills in handling various machines, instruments, apart from understanding the mechanism involved. Spectroscopy is such an analytical area that it imparts excellent knowledge of analytical work thereby it will provide broad path of understanding of any method that is taken up for study.

UNIT - I

Water technology: Water treatment for drinking purpose - sedimentation, coagulation, filtration, various methods of disinfection and concept of break-point chlorination.

Boiler troubles: scales, sludges, caustic embrittlement and boiler corrosion – causes and prevention.

Desalination of brakish water: Principle and process of electrodialysis and reverse osmosis,

Polymer technology: Conducting polymers – Examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped, p-doped and n-doped polyacetylenes – applications of conducting polymers – structure, importance and applications of polyaniline.

UNIT - II

Electrochemistry and Electrochemical energy systems

Reference electrodes: Calomel electrode, silver-silver chloride electrode, quinhydrone electrode and glass electrode, determination of pH using glass electrode, concept of concentration cells. Conductivity – Conductometric titrations and Potentiometric titrations.

Electrochemical energy systems: Types of electrochemical energy systems – Storage cells – Zinc-air battery, Ni-Cd battery, Lithium batteries – Li/MnO_2, $Li/SOCl_2$, Li/TiS_2 and $Li_xC/LiCoO_2$ – Advantages of lithium batteries – Electrochemical sensors – Principle, working and applications – Simple introduction to the terms – polarization, decomposition potential and overvoltage.

UNIT – III

Corrosion and its control

Introduction – chemical and electrochemical corrosion – electrochemical theory of corrosion – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – concept of passivity.

Forms of corrosion –pitting, crevice, stress corrosion cracking and microbiological corrosion. Factors affecting corrosion: Relative anodic and cathodic areas, nature of corrosion product, concentration of D.O., pH and temperature.

Protection methods: Cathodic protection (impressed current and sacrificial anode), anodic protection, corrosion inhibitors – types and mechanism of inhibition.

Electrolytic methods in electronics: Electroplating – principle and process of electroplating of copper on iron – Electroless plating – principle and electroless plating of copper, Self assembled monolayers.

UNIT - IV

Instrumental techniques in chemical analysis

Introduction of spectroscopy – interaction of electromagnetic radiation with matter.

UV-visible (electronic) spectroscopy: Frank-Condon principle – types of electronic transitions. Lambert-Beer's law, numericals (simple substitution) – Instrumentation-Single beam UV-visible spectrophotometer. Applications of UV-visible spectroscopy: qualitative analysis, quantitative analysis, detection of impurities, determination of molecular weight and dissociation constants.

Infrared (vibrational) spectroscopy: Principle of IR spectroscopy, types of molecular vibrations-stretching and bending vibrations, vibrational spectra diatomic molecules, selection rule for harmonic vibrational transition – Instrumentation. Applications of IR spectroscopy: Determination of force constant – numericals (simple substitution), detection of impurity and identification of nature of hydrogen bonding.

Learning Resources:

Text Books:

- Engineering Chemistry, *P.C. Jain*, 15th edition, Dhanpat Rai Publishing Company (P) Limited, New Delhi.

Reference Books:

- A text book of Engineering Chemistry, S.S. Dara, 10th edition, S. Chand & Company Limited, New Delhi.
- A text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Company Pvt. Ltd., New Delhi.
- Essentials of Physical Chemistry, B.S. Bahl and G. D. Tuli.

FY 1003B
BASICS OF CIVIL & MECHANICAL ENGINEERING

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives: Basic civil and Mechanical engineering is a foundation for Civil and Mechanical Engineering disciplines. This course is designed to enable the students to acquire fundamental knowledge in these two disciplines.

Learning Outcomes: After completion of this course, the student will have an idea about knowledge of stress, strain, various building materials used in construction industry, sub-structure elements, superstructure elements, surveying, dams, road transportation, bridges and its components. They also acquire basic knowledge on roads and bridges along with principles of surveying and structures. Also students acquire the knowledge about basic manufacturing processes, belt and gear drives for power transmission. They will have clear idea about the working of power plants, refrigeration, air conditioning and IC engines.

Part – A Civil Engineering

UNIT – I

Simple stress and strains: Definition of Mechanics- External and Internal forces-Stress and Strain-Elasticity and Hook's Law- Relations between elastic constants.

Civil Engineering Materials: Bricks, Stones, Cement, Steel and Cement Concrete.

Sub-structure and Super structure: Soil, Types of Foundations, Bearing capacity of Soil, Brick Masonry, Stone Masonry, Flooring, Roofing and Plastering.

UNIT – II

Surveying: Objectives, Types, Principles of Surveying. Measurement of distances, angles – Levelling.

Civil Engineering Structures: Roads- Classification, Cross section of roads.

Bridges- Necessity, Components, Classification.

Dams- Purpose, Classification

Part – B Mechanical Engineering

UNIT – III

Basic Manufacturing Methods : Principles of casting , green sand moulds , Advantages and applications of casting ; Principles of gas welding and arc welding, Soldering and Brazing ; Hot working – hot rolling , Cold working – cold rolling ; Description of basic machine tool- Lathe – operations – turning, threading, taper turning and drilling ;

Power Transmission : Introduction to belt and gears drives , types of gears , Difference between open belts and cross belts, power transmission by belt drives ; (theoretical treatment only) .

UNIT – IV

Power Plants : Introduction , working principle of nuclear power plant and steam power plant, Alternate sources of energy – solar , wind and tidal power;

Refrigeration& Air Conditioning : Definition – COP , Unit of Refrigeration , Applications of refrigeration system, vapour compression refrigeration system , simple layout of summer air conditioning system ;

IC Engines : Introduction , Main components of IC engines , working of 4-stroke petrol engine and diesel engine , working of 2- stroke petrol engine and diesel engine , difference between petrol and diesel engine , difference between 4- stroke and 2- stroke engines.

Learning Resources:

Text Books

1. **Basic Civil Engineering** by M. S. Palanichamy, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.(2002)
2. **Basic Mechanical Engineering,** by T S Rajan, Wiley Eastern Ltd., New Age International Ltd.(1993)

References:

1. **Refrigeration and Air Conditioning** by Zakria Baig, Radiant Publishing House, Hyd.
2. **Basic Civil and Mechanical Engineering** by G.Shanmugam and M S Palanichamy, Tata Mc Graw-Hill Publishing Company Limited, New Delhi.
3. **Thermal Engineering,** by R Rudramoorthy, Tata McGraw-Hill Publishing Company Ltd. New Delhi. (2003)

Web references :

www.result.khatana.net/2010/07/ge2152
www.engiblogger.com/mechanical/mechan
www.indiastudychannel.com/resources/5...
www.scribd.com/doc/15653381/Basic-Civ

FY 1004M
MECHANICS FOR ENGINEERS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives: Engineering mechanics is both a foundation and a framework for Civil and Mechanical engineering disciplines. This course provides a basic knowledge of rigid-body mechanics, elasticity and structural analysis. In particular, the principles of statics and their applications in engineering, the methods of static analysis, and techniques of engineering computation are expounded. This course is designed to enable students to acquire fundamental knowledge in engineering.

Learning Outcomes: After taking this course, the student acquires the knowledge and ability to:

- Solve for the resultants of any force systems;
- Determine equivalent force systems;
- Determine the internal forces in axial members and support reactions.
- Determine the centroids of plane and composite areas
- Determine the axial forces in the members of a given truss.
- Solve the problems associated with friction forces.

UNIT – I

Concurrent Forces in a Plane:

Principles of statics, Force, Addition of two forces: Parallelogram Law – Composition and resolution of forces – Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram. Equilibrium of concurrent forces in a plane – Method of projections –Moment of a force, Theorem of Varignon, Method of moments.

UNIT –II

Parallel Forces in a Plane:

Introduction, Types of parallel forces, Resultant. Couple, Resolution of Force into force and a couple. General case of parallel forces in a plane.

Centroids:

Introduction, Determination of centroids by integration method, Centroids of composite plane figures.

UNIT – III

General Case of Forces in a Plane:

Composition of forces in a plane – Equilibrium of forces in a plane -Plane Trusses**:** Method of joints.

Principle of Virtual Work:

Equilibrium of ideal systems.

UNIT – IV

Friction: Introduction, Classification of friction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction.

Learning Resources:

Textbooks:

1. Engineering Mechanics by S.Timoshenko & D.H.Young, McGraw Hill International Edition. (For Concepts and symbolic Problems).
2. Engineering Mechanics Statics and dynamics by A.K.Tayal, Umesh Publication, Delhi, (For numerical Problems using S.I.System of Units).

Reference Books:

1. Vector Mechanics for Engineers Statics and Dynamics by Beer and Johnston, Tata McGraw Hill Publishing Company, New Delhi.
2. Engineering Mechanics by SS Bhavikatti and KG Rajasekharappa
3. Singer's Engineering Mechanics Statics and Dynamics by K.Vijaya Kumar Reddy and J Suresh Kumar (Third Edition SI Units-BS Publications.)

Web References:

http://openlibrary.org/books/OL22136590M/Basic_engineering_mechanics
http://en.wikibooks.org/wiki/Engineering_Mechanics
http://nptel.iitm.ac.in/video.php?courseId=1048
http://imechanica.org/node/1551
http://emweb.unl.edu/
http://ebooks-freedownload.com/2009/11/engineering-mechanics-statics-12.html

http://www.ebookee.com/Engineering-Mechanics-Statics_37859.html

FY 1005
INTRODUCTION TO COMPUTING

Lecture	: 2 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	2

Objectives: The objectives for Introduction to Computers will enable the student to use the computer effectively in a multitude of academic scenarios. The numbers in parentheses refer to the standards that are addressed.

- Understand the basic parts of a computer system and their relationships.
- Master the basic functions of the Windows operating System.
- Understand and use basic computer terminology. To equip the graduates with a broad foundation of basic engineering concepts and fundamentals of Computer Engineering.
- To develop in graduates the capability to apply these learned concepts in Engineering design and to implement such a career as a practicing engineer.
- To inculcate in graduates the importance of lifelong learning.
- To develop in graduates an appreciation of technology and determine its use in the advancement of society.
- Use and maintain a secure, efficient computer system.
- Use a computer system for interactive communications.

Learning Outcomes: Upon successfully completing this course, students will be able to:

- Convert and calculate in binary, decimal, and hexadecimal number systems.
- Use correct terminology associated with information processing.
- Define CPU in terms of manufacturer, model number, speed, maximum addressable RAM, and bus size.
- Describe an Information System using examples from business, education, and personal use.
- Compare input and output devices found with a variety of PCs – sub-notebooks, notebooks, laptops, desktops, and etc.
- List and describe classes of software available for use today.
- Identify common elements in a graphical user interface.
- Compare and contrast operating systems to include graphical user interface and non-graphical user interface environments.
- Identify media, hardware, software, and procedural components linking telecommunications systems.
- Evaluate options for connecting to the Internet.
- Send e-mail, access remote servers, and identify resources available on the Web.
- List, compare, and contrast high-level and fourth-generation computer languages.

UNIT I:

Introduction:

Algorithms, Simple model of a computer, Characteristics of a computer, Problem solving using computers.

Data Representation: Representation of characters in computer, representation of Integers, fractions, number systems, binary system, octal system, hexadecimal system, organizing of memories, representation of numbers, alpha numeric characters, error detection codes.

Computer Generation and Classification: Computer generations, Classifications of computers.

UNIT II:

Computer Architecture:

Interconnection of units, Input Units: Keyboard, VDU, OMR, MICR, OCR and BAR Coding. Output Units: Types of Printers, Plotters,

Computer memory: Memory cell, Organization, Read-Only-Memory, Magnetic Hard Disk, CDROM.

UNIT III:

Computer Languages:

Why programming Language, Assembly language, Higher Level Programming Languages, Compiling High Level Languages.

Algorithm and Flowcharting:

Introductory programming techniques, Algorithms, Structure of Algorithms, Types of Algorithms, Structure of a Flowchart, Terminal Symbol Off page connector symbol, Modification Symbol, Group instruction symbol, Connection symbol, Drawing efficient flowcharts.

UNIT – IV

Introduction to operating system, functions of operating system, basic introduction to DOS, LINUX, WINDOWS –XP.

Definition and Applications of Computer Network, LAN, MAN and WAN, Intranet, Internet.

Learning Resources:

Text Book:

1. Fundamentals of Computers V. Rajaraman 4 th Edition PHI.

Reference Books:

1. Introduction to Computer Science; S. Govindaraju, M. Chandrasekaran, A. Abdul Haq, T. R. Narayanan; Wiley Eastern Limited
2. Computer Fundamentals by PK Sinha; BPB Publications, New Delhi

FY 1006
PROFESSIONAL ETHICS

Lecture	: 2 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	2

Objectives: The study of the course provides an understanding of Morals and characterization.

Learning outcomes : Upon completing this course students should be able to know the morals, Human Values, Ethics, Safety, Responsibilities and Rights

UNIT – I

Engineering Ethics : 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 –II

Human Values : Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT –III

Engineering as Social Experimentation: Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study
Safety, Responsibilities and Rights: 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 – IV

Global Issues: 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).

Learning Resources:

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

FY 1051C
ENGINEERING CHEMISTRY LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Objectives:

- To make students familiarize with the practical aspects of volumetric analysis of water samples ad determine the parameters like alkalinity, chlorides and hardness.
- To improve the knowledge of different types of titrations used in volumetric analysis
- To make students develop in terms of practical skills required for analytical projects.
- To imbibe the advantages of instrumental methods of chemical analysis
- To make students observe practically the aspects of corrosion rate determination, preparation of plastics and process of electroplating.

Learning Outcomes: After performing the experiments listed in the syllabus, the students will be able to

- Distinguish different types of titrations in the volumetric analysis
- Assess the quality of water based on the analysis done by them.
- Acquire practical knowledge related to the concepts like corrosion and its inhibition process, photochemical reactions, electroplating, etc.
- Exhibit the skills in performing experiments based on the theoretical fundamentals available.

List of Experiments

1. Determination of total alkalinity of water sample
   a) Standardisation of HCl solution
   b) Determination of total alkalinity
2. Determination of chlorides in water sample
   a) Standardisation of $AgNO_3$ solution
   b) Determination of chlorides in the water sample
3. Determination of hardness of water sample
   a) Standardization of EDTA solution
   b) Determination of total hardness of water sample
4. Determination of available chlorine in bleaching powder
   a) Standardisation of sodium thiosulphate
   b) Determination of available chlorine
5. Estimation of Mohr's salt – Dichrometry
   a) Standardization of $K_2Cr_2O_7$ solution
   b) Estimation of Mohr's salt
6. Estimation of Mohr's salt – Permanganometry
   a) Standardization of $KMnO_4$ solution
   b) Estimation of Mohr's salt
7. Conductometric determination of a strong acid using a strong base
8. pH metric titration of a strong acid vs. a strong base
9. Determination of corrosion rate of mild steel in the absence and presence of an inhibitor
10. Electroplating of Nickel on iron article

11. Chemistry of Blue Printing
12. Colorimetric determination of potassium permanganate
13. Preparation of Phenol-Formaldehyde resin
14. Spectrophotometry

Learning Resources

- "Experiments in Applied Chemistry" by Sunitha Rattan, S.K.Kataria & Sons.
- "Laboratory Manual on Engineering Chemistry" by S.K.Bhasin and Sudha Rani, Dhanpak Rai publishing company, New Delhi

FY 1052
BASIC COMPUTING LABORATORY

Lecture	: -	**Internal Assessment**: 25
Tutorial	: -	**Final Examination**: 50
Practical	: 3 hrs/ week	**Credits**: 2

Objectives: The Basic Computing Lab for engineers is a training lab course spread over 42 hours. The modules include training on Productivity tools including Word, Excel, Power Point, access, Internet & World Wide Web and PC Hardware.

Productivity tools module would enable the students in crafting professional word documents, excel Spread sheets, power point presentations and access using the Microsoft suite of office tools.

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition Accessing and Changing BIOS settings, tips and tricks would be covered.

Learning Outcomes: Information Technology has great influence on all aspects of life. Almost all work places and living environments are being computerized. In order to prepare Students to work in these environments, it is essential that they are exposed to various aspects of Information Technology such as understanding the concept of Information Technology and its Scope; Operating a Computer; use of various tools of MS-Office using Internet etc.

LIST OF PROGRAMS

1. Execution of Simple DOS Commands COPY, REN, DIR, TYPE, CD, MD, BACKUP
2. Create your Bio-Data in MSWord giving Educational and Personal Details.
3. Create an Excel Worksheet entering marks in 6 subjects of 10 Students. Give ranks on the basis of Total marks and also generate graphs.
4. Create a Database in MS-Access for Storing Library Information.
   Ex Fields: Book name, author, book code, subject, rack no, price, volumes Enter Sample data of 15 books in to database.
5. Design a PowerPoint presentation with not less than 10 slides on any of your interesting topic.
   Ex: Literacy, Freedom Struggle, Siddhartha Engineering College, Evolution of Computers, Internet etc.
6. Register for new Email address with any free Email provider and send Email using Internet to your friends, parents, teachers etc.
7. Search Internet using Search Engines like Google.com, Yahoo.com and

ask.com for files, pictures, power point presentations etc. Downloading files, EBooks, EContent from Internet.

8. Practice in installing a Computer System by giving connection and loading System Software and Application Software.
9. Accessing and Changing BIOS settings.
10. Installing Windows XP operating System.
11. Assembling of PC.
12. Disassembling of PC.

Learning Resources:

Text Books :

- Introduction to Computers with MSOffice, Alexis Leon and Mathews Leon TATA McGraw HILL.
- Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
- Familiarity With the computer, Software, Internet and their uses.

Reference Books:

- Computers Today by SK Basandra, Galgotia Publication Pvt. Ltd., New Delhi
- Fundamentals of Information Technology by Leon and Leon, Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi.
- Surviving in an E-World, Anushka Wirasinha, Prentice Hall of India Pvt. Ltd., New Delhi

FY 1053W
WORK SHOP PRACTICE

Lecture	: -	**Internal Assessment**: 25
Tutorial	: -	**Final Examination**: 50
Practical	: 3 hrs/ week	**Credits**: 2

Objectives: To provide the students with hands on experience on different trades of Engineering like Carpentry, Tin Smithy, Welding and House Wiring.

Learning Outcomes: To familiarize with:
1. The Basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.
2. The production of simple models in the above four trades.

List of Experiments:

1. Carpentry

To make the following jobs with hand tools
- a) Lap joint
- b) Lap Tee joint
- c) Dove tail joint
- d) Mortise & Tenon joint
- e) Cross-Lap joint

2. Welding using electric arc welding process / gas welding.

The following joints to be welded.
- a) Lap joint
- b) Tee joint
- c) Edge joint
- d) Butt joint
- e) Corner joint

3. Sheet metal operations with hand tools.
- a) Saw edge
- b) wired edge
- c) lap seam
- d) grooved seam
- e) funnel

4. House wiring
- a) To connect one lamp with one switch
- b) To connect two lamps with one switch
- c) To connect a fluorescent tube
- d) Stair case wiring
- e) Go down wiring

Learning Resources:

Reference Books:

1. Kannaiah. P & Narayana. K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai.

FY 2001
ENGINEERING MATHEMATICS -II

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives: By the study of this course the student is able to compare and contrast the idea of continuity and differentiability. Able to interpret the idea of optimization, locate and classify the extreme points. Also the students are taught interpolation and approximation of functions using finite difference technique.

Learning Outcomes: Based upon objectives the learning outcomes are

- Understand the concept of limit, continuity, differentiability. Learn mean value theorems and apply them in approximating functions, maxima and minima of two variables with constraints and with without constraints, curvature, radius of curvature.
- Evaluation of double, triple integrals by using change of order and finding area and volume in polar form and Cartesian form.
- Define and understand the geometry of vector differential operators and line, surface, volume integrals. State and use the major theorems of vector analysis.
- Understand the concept of finite difference technique for finding polynomial approximations for given f(x) numerically.

UNIT – I

Differential Calculus: Limit, continuity, differentiability – Rolle's Theorem – Lagrange's Mean Value Theorem – Taylor's Series (without proof) – Maxima and Minima of functions of two variables – Lagrange's multipliers – Curvature – radius of curvature – Centre of curvature.

UNIT – II

Integral Calculus: Double integrals – Evaluation in Cartesian and Polar coordinates – Changing the order of integration – Evaluation of areas using double integrals – Evaluation of triple integrals – Evaluation of volume using triple integrals, change of variables.

UNIT – III

Vector Calculus: Scalar and Vector fields – Differentiation of scalar and vector point functions – gradient of Scalar fields – directional derivatives – divergence and curl of vector fields – vector identities

Line and surface integrals – Green's theorem in a plane (without proof) – Gauss' divergence theorem (without proof) – Stoke's theorem (without proof).

UNIT – IV

Interpolation: Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton's formula for interpolation, Central difference interpolation formulae –Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae.

Learning Resources:

Text Books:

- A text book of Higher Engineering Mathematics by Dr.B.S.Grewal, 40th Edition. (Prescribed), Khanna Publishers
- A Text book o Engineering Mathematics by N.P.Bali, Manish Goyal, Laxmi Publications(P) Limited.
- A text book of mathematics by B.V.Ramana, Tata Mc Graw Hill.

Reference Books:

- Advanced Engineering Mathematics by Krezig., 8th Edition, John Wiley & Sons
- Advanced Engineering Mathematics by Peter.V.O.Neil, Thomson, Canada
- Advanced Engineering Mathematics by R.K.Jain and S.R.K.Iyengar, 3rd Edition - Narosa Publishers.

FY 2002P
ENGINEERING PHYSICS

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives: The contents of Engineering Physics have been designed to cater the needs of B.Tech students at freshmen level. "Engineering Physics" deals with the physics of substances that are of practical utility. It helps the students to gain a deep understanding of the key elements and the emerging like LASERS, SUPER CONDUCTIVITY, OPTICAL FIBERS AND NANO TECHNOLOGY.

Learning Outcomes:

UNIT-I

The control of electricity is evident in many devices, from microwave ovens to computers.

In this technological age, it is important to understand the basics of electricity and of how these basic ideas are used to sustain and enhance our current comfort safety and prosperity. In this unit student will learn the relationship of electrical currents to magnetism.

UNIT-II

In pre-graduation level students studied the basics of classical mechanics. In this unit the students will know the differences between classical and quantum mechanics. And also they will learn how this quantum mechanics is useful for the fields like medicine and industry.

UNIT-III

In this unit the students will learn how materials behave at low temperatures, causes for the behaviour and is advantages. In this unit students also learn about the advanced topics like LASERS, OPTICAL FIBERS and their applications in modern communication system.

UNIT-IV

In this unit students will learn about the "NANOTECHNOLOGY" which is an emerging field of Science and Emerging.

"NANOTECHNOLOGY" has a multi-disciplinary dimension exhibiting stronger interdependence in various fields. In this unit student also learn about the useful applications of nanotechnology in the various branches like medicine, biological, chemical, industrial,….etc.

UNIT – I

Electricity, Electromagnetism and Semiconductors: Gauss law in electricity (Statement and proof) and it's applications: Coulomb's law from Gauss law, spherically distributed charge, Hall effect, Biot-Savart's law: B due to a current carrying wire and a circular loop, Faraday's law of induction, Lenz's law, Induced electric fields, Gauss' law for magnetism, Maxwell equations (Qualitative treatment), Electromagnetic oscillations in LC circuit (quantitative), A.C. circuit containing series LCR circuit (Resonance condition).

Semiconductors: Carrier transport, Carrier drift, Carrier diffusion, generation and recombination process (qualitative), classification of materials based on energy diagram.

UNIT - II

Modern Physics: Dual nature of light, Matter waves and Debroglie's hypothesis, Davisson & Germer experiment, Heisenberg's uncertainty principle and its application (Non existence of electron in nucleus, Finite width of spectral lines), Classical and quantum aspects of particle. One dimensional time independent Schrodinger's wave equation, physical significance of wave function, Particle in a box (One dimension)O.

Optoelectronic Devices: LED, LCD, Photo emission, Photo diode, Photo transistor and Solar cell and its applications.

UNIT – III

Superconductors and Advanced Physics:

Superconductivity: Introduction, Critical parameters, Flux quantization, Meissner effect, Types of Superconductors, BCS theory, Cooper pairs, London's equation-penetration depth, high temperature super conductors, Applications of superconductors.

Advanced physics: Lasers: Spontaneous emission, stimulated emission, population inversion, Solid state (Ruby) laser, Gas (He – Ne) laser, Semiconductor (Ga As) laser, Applications of lasers, applications of Infrared radiation.

Fiber optics: Propagation of light through optical fiber, types of optical fibers, Numerical aperture, Fiber optics in communications and its advantages.

UNIT - IV

Nanotechnology: Introduction, Physical & Chemical properties. Fabrication: AFM, SEM, TEM, STM, MRFM. Production of nanoparticles: Plasma Arcing, Sol-gel, Chemical vapour deposition. Carbon nanotubes: SWNT, MWNT. Formation of carbon nanotubes: Arc discharge, Laser ablation; Properties of carbon nanotubes, Applications of CNT's & Nanotechnology.

Learning Resources:

Text Books:

1. Physics Part-II-Halliday and Resnick
2. Engineering Physics – Gaur and Gupta

Reference Books:

1. Solid State Physics – S.O.Pillai
2. Engineering Physics – M.Armugam
3. Modern engineering physics – A.S.Vasudeva
4. Engineering Physics – P.K. Palanisamy

FY 2003E

TECHNICAL ENGLISH & COMMUNICATION SKILLS

Lecture	: 2 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: 2 hrs/ week	**Credits**:	3

Objectives: This Course Endeavors to Refurbish and Fortify the Linguistic Awareness and Communicative Competence of the learners by offering insights into various Morphological, Semantic, Syntactic & Stylistic aspects of English Language. The ultimate aim of the course is to equip the learners with different forms of written and spoken communication in order that they withstand the competition at the transnational technical environment so as to enable them to undertake various professional operations.

Learning Outcomes: This course arms the students to face the challenges in communication primarily in a technical milieu as communicating formal and technical messages is essential for students. It enables the learner to take up all Oral and writing tasks with ease and confidence. It acts as a launching pad to students concerned with professional advancement

UNIT – I

WRITTEN COMMUNICATION SKILLS

This area exposes the learners to the basic tenets of writing; the style and format of different tools of written communication

(I) Description (through Paragraph Writing)
(II) Reflection (through Essay Writing)
(III) Persuasion (through indented Letter Writing)

UNIT – II

Reading Comprehension:

This area exposes the learners to the techniques of deciphering and analyzing longer texts pertaining to various disciplines of study.

(I) Types of Reading
(II) Sub skills of Reading
(III) Eye span – fixation
(IV) Reading Aloud & Silent Reading
(V) Vocalization & Sub-vocalization.

UNIT – III

A) Vocabulary and Functional English:

This area attempts at making the learners withstand the competition at the transnational technical environment so as to enable them to undertake various professional operations.

(I) Vocabulary – a basic word list of one thousand words.
(II) Functional grammar, with special focus on Common Errors in English.
(III) Idioms & Phrasal verbs.

B) **Listening and Speaking:**

This area exposes the learners to the standard expressions including stress, rhythm and various aspects of isolated elements and connected speech.

1) The use of diphthongs
2) Elements of spoken expression
3) Varieties of English
4) Towards accent neutralization

UNIT – IV

Technical Communication Skills:

This area falls under English for Specific Purposes (ESP) which trains the learner in Basic Technical Communication.

(I) Technical Report Writing (Informational, Analytical & Special reports)
(II) Technical Vocabulary

Learning Resources:

1. Use of English – Randolph Quirk, Longman, 2004.
2. Practical English Grammar– Thomson A.J & Martinet A.V, Oxford University Press, 2001
3. Common Errors in English – Thomas Eliot Berry, TMH, 2001.
4. Structural Patterns & Usage in English – B.S.Sarma, Poosha Series, th edition, 2007.
5. College Writing Skills - John Langan, McGraw Hill, 2004.
6. English for Academic and Technical Purposes – Sellinkar, Larry et. al., Newbury House Publishers, 1981.
7. Oxford guide to Plain English – Martin Cutts, Oxford University Press, 2004.
8. Phonetics and spoken English – V.Sethi and P.V. Dhamija, Orient Longman, 2004.
9. Technical Communication- Principles and Practice- Meenakshi Raman& Sangeet Sharma, Oxford University Press, 2009.

FY 2004EN
ENVIRONMENTAL SCIENCE

Lecture	: 3 hrs/ week	**Internal Assessment**: 30
Tutorial	: 1 hr/ week	**Final Examination**: 70
Practical	:	**Credits**: 3

Objectives: Environmental science is an interdisciplinary academic field that integrates physical and biological sciences (including physics, chemistry, biology, soil science, geology, and geography) to the study of the environment, and the solution of environmental problems. Environmental science provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems

Learning outcomes : After completion of the course students will be in a position to think about environmental issues from an interdisciplinary perspective.

UNIT I

INTRODUCTION
Definition, Scope and Importance of Environmental Sciences.

NATURAL RESOURCES MANAGEMENT

FOREST RESOURCES:
use and over exploitation, Mining and Dams their effects on Forest and Tribal people
WATER RESOURCES:
Use and over utilization of surface and ground water, Floods, Droughts, Water logging and Salinity, Dams - Benefits and Costs.
ENERGY RESOURCES:
Energy needs, renewable and Non renewable Energy sources, use of alternate Energy sources, Impact of Energy use on Environment.

UNIT II

ECOSYSTEMS:
Introduction, types, characteristic features, structure and functions of Ecosystem –Forest, Grass land, Desert, Aquatic (Lakes, Rivers and Estuaries).

BIODIVERSITY AND CONSERVATION:
Value of Biodiversity- Consumptive and Productive use, Social, Ethical, aesthetic and option values, Biogeographical classification of India. India as a mega diversity Habitat; Threats to Biodiversity - Hot spots, Habitat Laws, Poaching of Wildlife, loss of species, seeds, etc., In-situ and Ex-situ conservation of Biodiversity.

UNIT III

ENVIRONMENT&POLLUTION - LOCAL AND GLOBAL ISSUES:
Causes, effects and control measures of Air pollution, Indoor Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution.

SOLID WASTE MANAGEMENT: Urban, industrial, nuclear and e-waste management.

UNIT IV

INFORMATION TECHNOLOGY AND ENVIRONMENT:
Role of Information Technology in environmental sciences

SOCIAL ISSUES AND ENVIRONMENT:
Effects of human activities on the Quality of environment: Urbanization, Transportation, Industrialization, Green revolution, water scarcity and ground water depletion, Population growth and Environment: Environment impact Assessment.

ENVIRONMENTAL ACTS - Water (Prevention and control of pollution) act, air (prevention and control of pollution) act, Environmental Protection Act, Forest conservation act.

TEXT BOOKS

1. Anjaneyulu Y 2004, Introduction to Environmental Sciences, B S Publications
2. Anjireddy M Environmental Sciences & Technology, B S Publications, HYD
3. Benny Joseph, 2005, Environmental Studies, The Tata McGrawHill publishing company limited, New Delhi
4. Principles of Environmental Science & Engineering P.Venu Gopal Rao 2006 PHI, New Delhi
5. Ecological and Environmental Studies – Santosh Kumar Garg, Rajeswari Garg, Rajani Garg, 2006, Khanna Publishers, New Delhi.
6. Essentials of Environmental Studies, Kurian Joseph & R Nagendran, Pearson Education publishers, 2005

REFERENCE BOOKS

1. De A.K.Environmental Chemistry, Wiley Eastern Ltd.,

2. Bharucha Erach – Biodiversity of India, Mapin Publishing Pvt . Ltd

FY 2005
PROGRAMMING IN C

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	:	**Credits**:	3

Objectives: This course will give a solid grasp of the fundamental concepts of C programming, including some of the more challenging aspects of pointers, arrays, structures and defined types. This course also covers standard C libraries, as well as how to work with the GNU C compiler and debugger.

Learning Outcomes: Will learn following aspects of the C programming language

- Implement variables.
- List and describe common operators.
- Implement conditional statements.
- Implement looping constructs.
- Implement procedures.
- Handle errors.

UNIT – I

Constants, Variables and Data Types: Character Set, , Keywords and Identifiers, Constants, Variables, Data Types, Declaration of Variables, Assigning values to Variables, Declaring variable as a constant.

Operators and Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Increment and decrement operators, Conditional Operators, Bitwise Operators Special Operators. Precedence of Arithmetic Operators.

Managing Input and Output Operations: Introduction, reading a character, writing a character, formatted I/O.

UNIT – II

Decision Making and Branching: Introduction, Decision Making with IF statement. Simple IF Statement, the IF ELSE Statement, Nesting of IF ELSE Statement. The ELSE IF Ladder. The Switch Statement, the GOTO Statement, break and continue

Decision Making and Looping: Introduction, the WHILE statement, the DO Statement, the FOR statement, Jumps in Loops.

UNIT – III

Arrays: Introduction, One Dimensional Arrays, Declaration of one dimensional arrays, Initialization of one dimensional arrays, two-dimensional arrays, initializing two dimensional arrays, multi dimensional arrays.

Character Arrays and Strings: Introduction, Declaring and Initializing string variables. Reading strings from Terminal. Writing string to screen. Arithmetic operations on characters.

Putting strings together, Comparison of two strings, string handling functions.

User Defined functions: Introduction, user defined functions, storage classes, a multi function program, elements of user defined functions, definition of functions, return values and their types, function calls, function declaration, parameter passing techniques, recursion.

UNIT – IV

Structures and Unions: Introduction, defining a structure, declaring structure variables, accessing structure members, structure initialization, operations on individual members, Unions.

Pointers: Introduction, Understanding Pointers, accessing the address of the variable, declaring pointer variables, Initialization of pointer variables. Accessing a variable through its pointer.

File Management in C: Introduction, defining and opening a file, closing a file, Input/Output operations on files, pre processor directives and macros.

Learning Resources:

Text Book:

1. Programming in ANSI C, E. Balagurusamy, 4 ed., TMH Publishers

Reference Books:

1. Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill.
2. The C programming language by Kernighan B W and Ritchie O M, Prentice Hall.
3. Programming with C by K R Venugopal & Sudeep R Prasad, TMH.

Electronic Materials, Websites

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

FY 2007
ENGINEERING GRAPHICS

Lecture	: 2 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: 6 hrs/ week	**Credits**:	5

Objectives: The primary objective of this course is to develop the students to visualize and communicate all geometrical elements and also understanding the fundamentals of geometry like engineering curves, planes, solids, sections, developments & isometric views and its applications in the daily life.

Learning Outcomes: Student gets thorough knowledge of various Geometrical Elements used in Engineering Practice. He gets the insight into the Concepts of all 2 D elements like Conic Sections and 3 D Objects like various Prisms, Cylinders, Pyramids and Cones. He also understands the Projections of various objects and their representation and dimensioning. The Concept of Isometric Projections is thoroughly taught which will be useful for the visualiasation of any objects.

UNIT – I

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

Scales: Construction and use of plain and diagonal scales.

Conic Sections: conic sections - general construction method for ellipse, parabola and hyperbola. Special methods for conic sections.

Curves: Curves used in Engineering practice - Cycloidal curves - Cycloid, Epicycloid and Hypocycloid; Involute of circle.

UNIT – II

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

Projection of Planes : Projections of planes of regular geometrical lamina.

UNIT – III

Projections of Solids: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

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

UNIT – IV

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

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

Learning Resources:

Text Book:

1. Elementary Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). Forty-Ninth Edition – 2006.

Reference Books:

1. Text Book on Engineering Drawing by Prof. K. L. Narayana & Prof. P. Kannaiah. Scitech publications(India) Pvt. Ltd., Chennai Second Edition – fifth reprint 2006.

FY 2051P
ENGINEERING PHYSICS LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Objectives: The main objective is to provide students to learn about some important experimental techniques in physics with knowledge in theoretical aspects so that they can excel in that particular field.

Learning Outcomes: These experiments in the laboratory are helpful in understanding important concepts of physics through involvement in the experiments by applying theoretical knowledge. It helps to recognize where the ideas of the students agree with those accepted by physics and where they do not.

Minimum of 8 Experiments to be Completed out of the following

1. AC Sonometer – Verification of Laws
2. Sensitive Galvonometer –Figure of merit
3. Photo tube-study o f V-I Characteristics,determination of work function
4. Torsional Pendulum-Rigidity modulus calculation
5. Variation of magnetic field along the axis of current-carrying circular coil
6. Fibre Optics-Numerical aperture calculation
7. Compound pendulum-Measurement of 'g'
8. Solar cell – Determination of Fill Factor
9. Losses in Optical Fibres
10. LCR circuit-Resonance
11. Newton's Rings-Radius of curvature of plano convex lens
12. Hall effect- Study of B & I Variation
13. Photovoltaic cell-Energy gap
14. Measurement of thickness of a foil using wedge method
15. Diffraction grating-Measurement of wavelength

Learning Resources:

1. A text book of practical physics by Indu Prakash & Rama Krishna, vol.1, Kitab Mahal, Allahabad.
2. University practical physics by J.C. Mohanty, D.K. Mishra, Kalyani publishers, Delhi.
3. A laboratory manual of Physics by D P Khandelwal, vani educational books, Delhi.
4. Laboratory manual of engineering Physics by Dr. Y.Aparna, Dr. K. Venkateswara Rao, VGS Publications,Vijayawada.

FY 2052
'C' PROGRAMMING LABORATORY

Lecture	: -	**Internal Assessment**: 25
Tutorial	: -	**Final Examination**: 50
Practical	: 3 hrs/ week	**Credits**: 2

Objectives: This course will give a solid grasp of the fundamental concepts of C programming, including some of the more challenging aspects of pointers, arrays, structures and defined types. This course also covers standard C libraries, as well as how to work with the GNU C compiler and debugger.

Learning Outcomes: Will learn following aspects of the C programming language

- Implement variables.
- List and describe common operators.
- Implement conditional statements.
- Implement looping constructs.
- Implement procedures.
- Handle errors.

List of Lab Exercises

WEEK-I

1) Write a C-Program to perform the simple arithmetic operations.
2) Write a C-Program to calculate area and circumference of the triangle and rectangle.
3) Write a C-Program to swap the two numbers without using third variable.

WEEK-II

1) Write a C-Program to find the biggest of the given three numbers.
2) Write a C-Program to find the roots of the given quadratic equation.
3) Write a C-Program to implement the calculator application (using switch)

WEEK-III

1) Write a C-program to convert given Decimal number to Binary number.
2) Write a C-Program to check the given number is Palindrome or not.
3) Write a C-Program to check the given Armstrong or not.

WEEK-IV

1) Write a C-Program to find the sum first N natural numbers.
2) Write a C-Program to generate the Fibonacci series.

   Ex: 0,1,1,2,3,5,8,13,21,n^i , n^{i+1} , $n^i + n^{i+1}$
3) Write a C-Program to print the prime numbers between 1 to N.

WEEK-V

1) Write a C-Program to find the biggest and smallest numbers in the given array.
2) Write a C-Program to find the sum, mean and standard deviation by using arrays.

WEEK-VI

1) Write a C-program to remove duplicate elements in the given array.
2) Write a C-program to insert an element at the specified location of the array.
3) Write a C-program to store the polynomial using arrays and differentiate it.

WEEK-VII

1) Write a C-Program to perform the Matrix addition, subtraction and multiplication using arrays.
2) Write a C-Program to print the transpose of the given Matrix without using the second matrix.

WEEK-VIII

1) Write a C-Program to find the given element is exist in the given list or not.
2) Write a C-Program to arrange the given elements in the ascending order.

WEEK-IX

1) Write a C-Program to check the given string is Palindrome or not.
2) Write a C-Program to perform the following operations with and without using String handling functions

   i) Length of the string ii) Reverse the given string

   ii) Concatenate the two strings iv) Compare the two strings

WEEK-X

1) Write a C-Program to swap the two number using call by value and call by reference.
2) Write a C-Program to find the factorial of the given number using recursion.

3) Write a Program to find NCR using functions.

4) W rite a Program to find Mean and standard deviation of a given set of numbers.(Define functions for mean and standard deviation)

WEEK-XI

1) Write a 'C' program to read name of the student, roll number and marks obtained in subjects from keyboard and print name of the student, roll number, marks in 3 subjects, and total marks by using structures concept.

2) Write a C-program to count number of characters, spaces, words and lines in given file.

3) Write a 'C' Program to copy the contents of one file into another file.

EE/EI/EC 3001
ENGINEERING MATHEMATICS-III

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ Week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
After studying the course the student can be able to:

1. Determine the Laplace Transforms of function of time, inverse Laplace transforms of Laplace transforms, understand convolution theorem and solve differential equations
2. Represent a periodic function in terms of the trigonometric or exponential form of the Fourier series.
3. Determine the Fourier Transform of functions.
4. Numerical differentiation and integration. Numerical solution of ODE and PDE

Learning Outcomes:
Upon completion of this course the student will be able to:

1. Solve initial value problems using Laplace Transforms.
2. Fourier series expansions of a function given analytically, numerically, graphically.
3. Compute Fourier transforms and their inverse transforms for given functions. Evaluate improper integrals and solve integral equations.
4. Solve algebraic and transcendental equations numerically. Solve system of equations.
5. Find the function of f(x) for the given data set.
6. Differentiate and integrate the functions given numerically.
7. Solve boundary value problems.

Course Content:

UNIT - I
LAPLACE TRANSFORMS: Definition and basic theory – Linearity property – condition for existence of Laplace transform. First & Second Shifting properties, Laplace Transform of derivatives and integrals; Unit step functions, Dirac delta-function. Differentiation and Integration of transforms, Convolution Theorem, Inversion. Periodic functions. Evaluation of integrals by Laplace Transform. Transforms of periodic function. Unit impulse function (Dirac delta function). Applications to differential equations with constant coefficients, variable coefficients.

UNIT – II
FOURIER SERIES: Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, odd and even functions, Expansions of odd and even periodic functions, Half - range series, Parseval's formula, complex form of Fourier series.

UNIT – III

FOURIER SERIES: Practical harmonic analysis.
FOURIER TRANSFORMS: Introduction, Definition, Fourier integrals, Fourier sine and cosine integrals - complex form of Fourier integrals. Fourier transforms, Fourier sine and cosine transforms - Finite Fourier sine and cosine transforms, Fourier transforms of the derivatives of a function.

UNIT – IV
NUMERICAL METHODS: Solution of Algebraic and Transcendental Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method.
NUMERICAL DIFFERENTIATION AND INTEGRATION : Finding first and second order differentials using Newton's formulae. Trapezoidal rule, Simpson's rule. Numerical solutions of ordinary and partial differential equations, Euler's method, Taylor's series method Picard's method. Runge - Kutta method of 4th order, Predicator and Corrector method, Milne's method, Adams - Bashforth method (for first order equations only). Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.

Learning Resources:

Text Books
1. Higher Engineering Mathematics by B.S. Grewal , 40th edition – Khana Publishers, New Delhi for Unit –I, II, III
2. Engineering Mathematics by N.P.Bali, Manish Goyal, 7th Edition – Laxmi Publications for Unit –I, II, III
3. Introductory Methods of Numerical Analysis by S.S.Sastry for Unit –IV

Reference Books
1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition – Wiley Publishers
2. Advanced Engineering Mathematics by Jain Iyengar, 3rd Edition – Narosa Publishers

EE 3002
ELECTRO-MAGNETIC FIELD THEORY

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:
To introduce the concepts of electric field and magnetic fields and their applications which will be utilized in the development of the theory for power transmission lines and electrical machines.

Learning Outcomes:

1. Understand the coordinate systems and learn mathematical operations related to fields. Understanding Coulomb's law and Gauss's law and applications of these laws in analyzing electrostatic fields.
2. Understand the properties of materials under the influence of electric field. Deriving Poisson's and Laplace's equations and learn general procedures for solving these equations.
3. Understand Biot-Savart's Law and Ampere's Circuital law and applications of these laws in analyzing magnetic fields. Understanding the properties of materials under the influence of magnetic fields.
4. Understand the Maxwell's equations and principles of propagation of uniform plane waves in unbounded media.

Unit I

INTRODUCTION TO COORDINATE SYSTEMS AND VECTOR CALCULUS: [Text Book - 1]
Cartesian, cylindrical and spherical coordinate systems. differential length, area and volume. Line, surface and volume integrals. Del operator, gradient of a scalar, divergence of a vector and divergence theorem. Curl of a vector and Stokes Theorem. Laplacian of a scalar.

ELECTROSTATICS: [Text Book - 1]
Coulomb's law and field intensity, Electric fields due to continuous charge distributions, Electric flux density. Gauss's law – Maxwell's Equation, applications of Gauss's law, Electric potential, relationship between **E** and V – Maxwell's Equation, an electric dipole and flux lines, energy density in electrostatic fields.

Unit II

ELECTRIC FIELDS IN MATERIAL SPACE: [Text Book - 1]
Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constant and strength, continuity equation and relaxation time, boundary conditions.

ELECTROSTATIC BOUNDARY-VALUE PROBLEMS: [Text Book - 1]
Poisson's and Laplace's equations, Uniqueness theorem, general procedures for solving Poisson's and Laplace's equations, resistance and capacitance, method of Images**.**

Unit III

MAGNETO STATIC FIELDS: [Text Book - 1]
Biot-Savart's law, Ampere's circuit law – Maxwell's equation, applications of Ampere's law, Magnetic flux density – Maxwell's equation, Magnetic scalar and vector potentials.

MAGNETIC FORCES, MATERIALS AND DEVICES: [Text Book - 1]
Forces due to magnetic fields, magnetic torque and moment, magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

Unit IV

MAXWELL'S EQUATIONS: [Text Book -1]
Faraday's law, transformer and motional electromotive forces, displacement current, Maxwell's equations in final forms, time-harmonic fields.

ELECTROMAGNETIC WAVE PROPAGATION: [Text Book - 1]
Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane waves in free space, plane waves in good conductors, power and Poynting vector, reflection of a plane wave at normal incidence.

Learning Resources:

Text Books:

1) Matthew N.O.Sadiku, Principles of Electromagnetics, 4E, Oxford University Press, New Delhi, 2009

Reference Books:

1) W.H.Hayt and J.A.Buck, Engineering Electromagnetics, 7E, Tata McGraw Hill, New Delhi, 2006
2) Electromagnetics – Theory and problems by Joseph A.Edminister, 2nd ed.,1993, Schaum's outline series, MCGraw Hill
3) Field Theory by K.A.Gangadhar and P.M. Ramanathan, 15th ed., 2002, Khanna Publications
4) Electromagnetism-Theory and Applications by Ashutosh Pramanik, PHI, 2003

Other learning materials such as computer-based programs/CD, professional Standards/regulations:

- IIT, NPTEL video lessons
- MIT video lessons

EE/EI 3003
BASIC ELECTRONIC DEVICES AND CIRCUITS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objectives:

- The objective is to provide clear explanation of the operation of all the important electronic devices generally available today.
- To show how each device is used in appropriate circuits
- To demonstrate how such circuits are designed

Learning Outcomes:

Based upon objectives the learning outcomes are

- Students will get familiar knowledge about the Semiconductor Devices like Diode, BJT, Uni-polar devices like. JFET, MOSFET & UJT, power devices like SCR, TRIAC and DIAC their applications

Course Content:

UNIT – I

ELECTRON DYNAMICS: Motion of a charged particles in parallel & perpendicular electric fields, Electrostatic deflection in a CRT, Motion of charged particles in magnetic field, Magnetic deflection in a CRT, Electrostatic and magnetic focussing, Principles of CRT.

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

UNIT – II

SEMICONDUCTOR DIODES: Quantitative theory of P-N junction diode, Energy band diagram of P N junction diode, V – I Characteristics and its temperature dependence, Transition and Diffusion capacitances of P-N junction diode, Limitations and specifications of diodes, Break down of junctions under reverse bias. Avalanche Diode, Zener Diode, Varactor Diode, Tunnel Diode (with the help of energy band diagram), Photo Diode, LED and LCD: Characteristics.

RECTIFIERS: Diode as a Rectifier, Half wave, Full wave and Bridge Rectifiers without filter and with inductor filter, Capacitor filter, L section and π - section filters, multiple L section, multiple π section filters.

UNIT III

JUNCTION TRANSISTOR: NPN & PNP junction transistors, Transistor current components, Transistor as an Amplifier, CB, CE and CC configurations and their characteristics, DC bias and its stabilization, Various Stabilization and Compensation circuits, Thermal runaway and thermal stability, Photo transistor.

UNIT IV

UNIPOLAR DEVICES: JFET, Depletion-MOSFET, and Enhancement-MOSFET: Basic construction, operation, Drain and Transfer characteristics, FET Parameters - rd, gm, μ; biasing methods, CG, CD, CS configurations. UJT: Basic construction, electrical equivalent circuit and operation, emitter characteristics.

POWER DEVICES: P-N-P-N Devices, SCR-Two transistor analogy and characteristics, DIAC and TRIAC: (their characteristics only)

Learning Resources

Text Books

1. Jacob Millman, Christos C Halkias & Satyabrata JIT, "Millman's Electronic Devices and Circuits", TMH, 2007 (Unit I,II,III & IV)

Reference Books

1. Robert L Boylested and Louis Nashelsky , Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003
2. David A Bell, Electronic Devices and Circuits, 4th Edition, PHI, 2003
3. NN Bhargava , DC Kulshrestha and SC Gupta – Basic Electronics and Linear Circuits, TTTI Series, TMH, 2003.

Web Resources

1. **http://nptel.iitm.ac.in/courses.php?branch=Ece**
2. **http://en.wikipedia.org/wiki/Electronics**

EE 3004
NETWORK ANALYSIS – I

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

Network analysis is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of DC circuits, Single phase and three phase AC circuits, network theorems and coupled circuits.

Learning Outcomes:

1. Understand the basic electrical network analysis techniques, power terminology in AC circuits and application of these concepts in analysing complex DC and AC circuits.
2. Understand various theorems and application of these theorems in analysing DC and AC circuits. Learn the concepts of series and parallel Resonance and locus diagrams.
3. Understand the concepts of poly phase circuits and application of these concepts in analysing various three phase circuits. Learn the concepts of measurement of active and reactive powers in three phase circuits.
4. Understand the concepts of mutually coupled coils and application of these concepts in analysing various coupled circuits.

Unit I

Electric Circuits: [Text Book - 1]

Electrical circuit, Electrical current - reference directions, double script notation, direct & alternating currents; Voltages - reference polarities, double script notation; power & energy, passive reference configuration, power & energy calculations, instantaneous power, average power.

Kirchhoff's voltage law, series circuit, Kirchhoff's current law, parallel circuit.

Introduction to circuit Elements - Conductors, Voltage sources, Current sources,

Resistors. (Circuit, physical and energy views)

Resistive Circuits:

Resistances in series and parallel, Network analysis by using series and parallel equivalents, Voltage and current divider circuits, Node- voltage and Mesh- current analyses, Thevenin, Norton, Superposition and Maximum power transfer theorems

Inductance and capacitance:

Capacitance - circuit, physical and energy views, Capacitances in series & parallel.

Inductance - circuit, physical and energy views, Inductances in series & parallel, Mutual inductance.

Unit II

SINUSOIDAL STEADY-STATE ANALYSIS: [Text Book - 2]

Introduction, Characteristics of Sinusoids, Forced Response to Sinusoidal Functions, The Complex Forcing Function, The Phasor, Phasor Relationships for R, L and C, Impedance, Admittance, Phasor diagrams, Nodal and Mesh Analyses.

AC POWER CIRCUIT ANALYSIS: [Text Book - 2]
Introduction, Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power and Power Factor, Complex Power, Comparison of Power Terminology.

Unit III

USEFUL CIRCUIT ANALYSIS TECHNIQUES: [Text Book - 3]
Linearity and Superposition, Source Transformations, Delta-Wye conversion, Thevenin's Theorem, Norton's Theorem, Maximum power transfer theorem, Substitution theorem, Reciprocity theorem, Millman's theorem, Tellegen's theorem **(Statement, illustration & application to AC & DC circuits)**

SERIES AND PARALLEL RESONANCE: [Text Book - 3]
Series Resonance, Impedance and Phase angle of a Series Resonant circuit, Voltages and Currents in a Series Resonant circuit, Bandwidth of an RLC circuit, The Quality factor (Q) and its effect on Bandwidth, Magnification in Series Resonance.
Parallel Resonance, Resonant frequency for a tank circuit, Variation of Impedance with frequency, Q factor of Parallel Resonance, Magnification in Parallel Resonance, Reactance curves in Parallel Resonance.
Locus diagrams, current locus diagrams.

Unit IV

POLYPHASE CIRCUITS: [Text Book -3]
Polyphase System, Advantages of Three-Phase System, Generation of Three-Phase Voltages, Phase Sequence, Inter Connection of Three-Phase Sources and Loads, Star to Delta and Delta to Star transformation. Voltage, Current and Power in a Star Connected System. Voltage, Current and Power in a Delta Connected System. Three-Phase Balanced circuits.
Power measurement in Polyphase circuits: Power measurement in a Single-Phase circuit by wattmeter, Power in Three-Phase circuits, Three wattmeter and Two wattmeter methods, Power Factor of balanced circuits by two wattmeter method, Variation in wattmeter readings with load power factor (lag and lead p.f loads), Measurement of reactive power with two wattmeters and a single wattmeter.

COUPLED CIRCUITS: [Text Book - 3]
Introduction, Conductively coupled circuits and mutual Impedance, Mutual Inductance, Dot convention, Coefficient of Coupling, Ideal Transformer, Analysis of Multi-Winding Coupled Circuits, Series connection of coupled Inductors, Parallel connection of coupled coils.
Tuned circuits – Single Tuned circuit, Double tuned circuits.

Learning Resources:

A. Text Books:

1) Allan R. Hambley, Electrical Engineering Principles and Applications, 3E, PHI, New Delhi
2) W.H.Hayt, J.E.kemmerly and S.M.Durbin, Engineering Circuit Analysis, 6th Edition, Tata McGraw-Hill, New Delhi, 2006
3) A.Sudhakar and P.Shyam Mohan, Circuits and Networks Analysis and Synthesis, 2nd Edition, Basic Electrical Engineering, Tata McGraw-Hill, New Delhi, 2004

B. Reference Books:

1) Joseph A. Edminister ., Theory and Problems of Electric Circuits, Schaum's Outline Series, McGraw Hill Book Company, 5th Edition, 1994.
2) A.Chakrabarti., Circuit Theory (Analysis and Synthesis) , 5th Edition, Dhanpat Rai & Co. Delhi, 2008

EE/EI 3005
DIGITAL ELECTRONICS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
The main object of this course is to examine digital signals; build simple power supplies and explain their operation; demonstrate the operation of simple digital gates, identify the symbols, develop the truth table for those gates; combine simple gates into more complex circuits; change binary and hexadecimal numbers to their decimal equivalent; change decimal numbers to binary or hexadecimal numbers; explain the meaning of not; demonstrate the operation of a flip-flop.

Learning outcomes
On successful completion of this course, students will be able to design, simulate and analyze simple combinational logic circuits, using standard logic gates.
Design, simulate and analyze simple sequential logic circuits, using standard flip-flops
Boolean algebra and related techniques to simplify logical expressions; use the binary number system to carry out basic arithmetic operations, and to implement these operations using digital circuits. Design and test a suitable digital circuit to meet a simple design brief.

Course Content
UNIT – I

NUMBER SYSTEM:
Decimal, Binary, Octal and Hexadecimal number systems and their conversion. Addition, Subtraction, Multiplication and Division using different number systems. Representation of Binary numbers in sign magnitude, 1's compliment and 2's compliment form, Subtraction with compliment representation. Binary codes, BCD codes, 8421 code, Excess-3 code, Gray code, Error detection using Hamming code.
BOOLEAN ALGEBRA:
Fundamental concepts of Boolean algebra, Boolean functions, Demorgan laws, simplification of Boolean expressions, Canonical and standard forms of Boolean functions, SOP and POS forms, Logic gates, realization of Boolean functions using Basic and Universal gates.

UNIT-II

COMBINATIONAL LOGIC DESIGN:
Simplification of Logical functions using Karnaugh map method (Two, Three and Four variable), Don't-Care conditions, Quine-McCluskey Minimization technique, Determination of prime implicants, Selection of prime implicants
COMBINATIONAL LOGIC CIRCUITS USING DISCRETE LOGIC GATES: Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor, Carry Look-Ahead carry adder, Encoders, Decoders, Multiplexers, Demultiplexers, Parity Generator, Code Converters, 7-Segment display decoder, PLA design, ALU, ROM.

UNIT-III

SEQUENTIAL LOGIC DESIGN:
Flip-Flops – SR flip-flop using NAND and NOR gates, Clocked SR, D, T and JK flip-flops, Level triggering, Edge triggering – Truth tables, Excitation tables of flip-flops, Master Slave JK flip-flop, Flip-flops with Preset and Clear.

COUNTERS
Modulus of a Counter, Binary Counter, BCD Counter, Up-Down counter, Asynchronous counters, Synchronous counters, Design of Synchronous counters using State diagrams and Excitation tables, Lock-Out in counters, Johnson counter, Ring counter, Sequence generator.

REGISTERS
Shift Left, Shift Right, SISO, SIPO, PISO, PIPO registers, Bi-directional register, Universal Shift register

UNIT – IV

LOGIC FAMILIES:
Characteristics of Digital IC's, Resistor-Transistor logic, Direct-Coupled Transistor logic, Integrated-Injection logic, Diode-Transistor logic, High-Threshold logic, Transistor-Transistor logic, Schottky TTL, Emitter-Coupled logic, MOS logic and CMOS logic families.

Learning Resources

Text Books

1. M.Morris Mano, digital logic &computer design. PHI,2003. (Unit I,II,III & IV)
2. R P Jain : Digital Electronics, 4th Edition TMH

Reference Books

1. Taub & Schilling: Digital integrated electronics, McGraw-Hill
2. A.P .Godse, D.A.Godse , switching theory and logic design.

Web Resources

1. http://www.docstoc.com/docs/14901337/Fundamentals-of-Digital-Electronics
2. http://www.ebookee.com/Fundamentals-of-Digital-Electronics_313329

EE 3006
DC MACHINES

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Course Objective:

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

Learning Outcomes:

After completing this course, students will be able to:

1. Identify different parts of D.C machine and their working.
2. Analyze how the air gap flux will be distorted when a D.C. machine is loaded.
3. Design compensating winding to nullify the effects of armature reaction.
4. Decide which kind of D.C. machine is to be used for particular application using their characteristics.
5. Find efficiency of a given D.C. machine using several methods
6. Control the speed of a D.C motor using different methods.
7. Design a starter for a D.C. motor.
8. Design the dimensions of D.C. machines when specifications are given.

Unit–I

DC GENERATORS - CONSTRUCTION & OPERATION:

Principle, constructional features and operation of DC generators, EMF equation, Types of Windings – lap and wave.

ARMATURE REACTION:

Armature reaction and compensations, commutation and interpoles.

Unit–II

DC GENERATORS – ANALYSIS AND APPLICATIONS:

TYPES OF DC GENERATORS: Methods of Excitation- Building up of EMF-Critical resistance & Critical Speed for shunt and series generators.

CHARACTERISTICS AND PARALLEL OPERATION:

No load and load characteristics of all types of DC generators, their applications and parallel operation

Unit-III

DC MOTORS:

Principle, constructional features and operation of DC motors, Torque equation, Characteristics of different types of DC motors, applications, speed control of DC shunt, series and compound motors, DC motor starters and their design

PERFORMANCE AND TESTING:

Losses, efficiency and testing of DC machines - Brake test, Swinburne's, Hopkinson's, Retardation test and Field's Test.

Unit–IV

SPECIAL TYPES OF DC GENERATORS:

Principle, operation and applications of Rosenberg generator, Amplidyne and Metadyne

DESIGN OF DC MACHINES:

Main Dimensions of D.C. Machines and Design of Armature Winding (simplex lap and wave).

Learning resources:

Text Books:

1. The Performance & design of D.C.Machines by A.E.Clayton, BPB publisher
2. Electrical Machines by P.S.Bhimbra, Khanna Pub.

Reference Books:

1. Electric Machinery, 6th Ed. By Fitzgerald & Kingsley, TMH
2. Electrical Machines by I.J.Nagrath and D.P. Kothari 3rd Ed., TMH
3. Theory & performance of Electric Machines, by J.B.Gupta, S.K.Kataria & Sons
4. Electrical Machines – 1 by Shyammohan S Palli, TMH

EE 3051
ELECTRICAL NETWORKS AND MACHINES LABORATORY – I

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course objectives:

To make Students understand the basic theorems in Electrical Engineering and to develop on hand experience with DC generators and motors by allowing them to conduct various experiments on them.

Learning Outcomes:

The students will understand the basic theorems in Electrical Engineering and able to analyse the performance of various DC generators and motors.

Topics/Syllabus:

1. Verification of KCL & KVL
2. Verification of superposition theorem
3. Verification of reciprocity theorem
4. Verification of Thevinin's theorem
5. Verification of maximum power transfer theorem
6. Determination of parameters of choke coil
7. Locus Diagrams of R-C and R-L circuits
8. Open circuit characteristics of separately excited generator.
9. Load test on DC shunt generator
10. Load test on DC series generator.
11. Load test on DC compound Generator
12. Speed control of DC shunt motor
13. Brake test on DC shunt motor
14. Brake test on DC compound Motor
15. Brake test on DC Series Motor
16. Swinburne's Test

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE 3052
ELECTRONICS LABORATORY – I

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course objectives:
To make Students understand the characteristics of the various Electronic devices and design the combinational and sequential circuits.

Learning outcomes:
Students are able to design and fabricate Simple Electronic circuits and the combinational and sequential circuits using IC's and gates.

List of Experiments:

ELECTRONIC DEVICES LAB:

1. Characteristics of PN Junction Diode and Zener Diode.
2. Analysis of Half Wave & Full Wave Rectifiers with and without filter.
3. Characteristics of Transistor in Common Base Configuration.
4. Characteristics of Transistor in Common Emitter Configuration.
5. Verification of Transistor Self-Bias Circuit.
6. Characteristics of Junction Field Effect Transistor
7. Characteristics of Unijunction Transistor.
8. Characteristics of Silicon Controlled Rectifier.

DIGITAL ELECTRONICS LAB:

1. Realization of logic gates using Discrete Components and Universal gates.
2. Adders/ Subtractor. Using IC 7483
3. Binary to gray and gray to Binary conversions
4. Verification of Flip-Flops using gates
5. Design of synchronous and Asynchronous counters Using flip flops and IC 74163
6. UP/DOWN Counters using IC 74193
7. BCD-7 segment display using IC 7447
8. Design of MUX and DEMUX

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE/EI 4001
MATHEMATICS – IV

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objective:

1. Define complex variable functions, conformal mapping, analyticity of complex functions, complex integration, evaluation of real definite integrals using residue theorem.
2. Understand probability density function for continuous random variable and their distribution functions with mean and variance. Sampling distribution for large and small samples, curve fitting, linear regression and finding correlation coefficient.

Learning Outcomes:

Upon completion of this course the student will be able to:

- Determine analytic functions and non analytic functions, evaluate real definite integrals by complex integration.
- Estimates probability densities using different techniques.
- Determines variance and S.D of sampling distribution, estimate population by means of sampling technique.

UNIT I

COMPLEX ANALYSIS:

Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula.

UNIT II

Taylor's series, Laurent's series, Zeros and singularities. Residue theorem, calculation of residues, evaluation of real definite integrals (by applying the residue theorem)

Standard transformations : Translation - Magnification and Rotation – Inversion and reflection - Bilinear transformation

UNIT III

PROBABILITY DENSITIES: Continuous random variables – Normal distribution – Normal approximation to the binomial distribution – Other probability densities – Uniform distribution – Log – Normal distribution – Gamma distribution – Beta distribution – Weibull distribution – joint distributions – Discrete and continuous checking if the data are normal – Transforming observations to near normally.

UNIT IV

SAMPLING DISTRIBUTIONS: Populations and samples – Sampling distribution of the mean (SD known) – Sampling distribution of the mean (SD unknown) – Sampling distribution of the variance.

Statistics: Method of Least Squares – correlation – Regression.

TEXT BOOKS

1. Higher Engineering Mathematics by B.S. Grewal , 37th edition - Khana Publishers, NewDelhi

REFERENCE BOOKS

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition - Wiley Publishers

EE 4002
ANALOG ELECTRONICS – I

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
To get an exposure about various transistor configurations and analysis of FET amplifiers, to have an idea about the frequency response of amplifiers and different types of feedback and to have a clear understanding of operation of oscillators and power supplies

Learning outcomes:
To enable the students to have a fair knowledge about the transistors and amplifiers, basic concepts of feedback, oscillators and power supply.

Unit-I

LINEAR WAVE SHAPING:
Response of RC high pass filter and low pass filter to step, pulse, ramp, exponential and sinusoidal inputs.

NON-LINEAR WAVE SHAPING:
Clipping circuits with diodes, multidiode circuits, transient and steady state response of a diode clamping circuit, the clamping theorem, practical clamping circuits.

Unit–II

TRANSISTOR AMPLIFIERS:
Small signal low frequency model for transistor, analysis of transistor amplifiers using h-parameters, single and two stage transistor amplifier circuit at low frequencies, high input resistance transistor circuits, cascade transistor configuration.

Unit–III

TRANSISTOR AT HIGH FREQUENCIES:
BJT at high frequencies, Hybrid PI model, CE short circuit current gain with resistive load, single stage CE transistor amplifier response, Emitter follower at high frequencies, gain bandwidth product.

Unit–IV

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

FET AMPLIFIERS:
FET Amplifiers at low frequencies, CS/CD/CG configurations at low frequencies, FET amplifier at high frequencies – CS/CD amplifiers.

Learning Resources:

Text Books:
1. Electronic Devices and Circuits by Millman & Halkias TMH, 2002
2. Integrated Electronics by Millman and Halkias, TMH

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

EE 4003
NETWORK ANALYSIS – II

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

- To be equipped with advanced network analysis techniques
- To understand various two-port networks and their importance.
- To know the concept of transfer function of a network and the nature of response to external inputs.
- To know the concept and design of frequency selective filters.

Learning Outcomes:

The student will be able to

- Apply Laplace and Fourier transforms to analyze electrical networks
- Determine steady state and transient responses
- Find network functions and two-port parameters
- Design k and m filters
- Analyze electrical networks using PSPICE

Unit I

LAPLACE TRANSFORMS: [Text Book - 2]

Introduction, Laplace transforms of Step, Ramp and Impulse signals, Waveform synthesis – Laplace transform of Periodic Signals. Convolution integral. Initial value and final value theorems

TRANSIENTS: [Text Book - 1]

Introduction, Direct current Transients – *RL* Transient, *RC* Transient, *RLC* Transient, two mesh transients. Alternating Current Transients - *RL* Sinusoidal Transient, *RC* Sinusoidal Transient, *RLC* Sinusoidal Transient, two mesh transients. **(Both Differential equation and Laplace Transform approaches)**

Unit II

NETWORK FUNCTIONS: [Text book-2]

Concept of complex frequency, Definition of operational/ transformed impedances and admittances of L, C and transformer with initial conditions; development of transformed networks incorporating initial conditions as sources and solution of transformed networks; network functions for the Two-Port bridged – T, Ladder and Lattice networks; Poles and Zeros of network functions; Restrictions on poles and zeros for driving- point and transfer functions.

TWO PORT NETWORKS: [Text book-2]

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

Unit III

FOURIER CIRCUIT ANALYSIS: [Ref.Book-1]

Introduction, Trigonometric form of the Fourier series, The use of symmetry, Complete Response to periodic Forcing Functions, Complex form of the Fourier series, Definition of the Fourier Transform, Some properties of the Fourier Transform, Fourier Transform pairs for simple time functions, The Fourier Transform of a general periodic function, The system function and response in the frequency domain, The physical significance of the system function.

FILTERS: [Ref.Book-2]

Classification of Filters, Filter networks, Equations of Filter networks, Classification of Pass band and stop band, characteristic Impedance in the Pass and Stop bands, Constant-K Low pass Filter, Constant-K high pass Filter, m-Derived T-section, Band pass and elimination Filters.

Unit IV

NETWORK TOPOLOGY: [Text book-1]

Definitions-graph, planar and nonplanar, connected and oriented graph, sub graph, path, tree & tree branches, co-tree and links, formation of linearly independent loops, basic tie set and cut - set matrices, loop and nodal analysis. Duality and dual networks

PSPICE FOR CIRCUIT ANALYSIS: [Text book-1]

Introduction, Getting started with PSPICE, simulation steps, Component values, DC analysis and control statements, dependent sources, DC sweep, AC analysis and control statements, Transient analysis.

Learning Resources:

Text Books:

1) A. Sudhakar, Shyammohan S. Palli, "Circuits and Networks Analysis and Synthesis", Second Edition, Tata McGraw-Hill, 2002.
2) M.E.Van Valkenburg "Network Analysis" PHI, 3/E, 2003.

Reference books:

1) W.H.Hayt, J.E.kemmerly and S.M.Durbin, Engineering Circuit Analysis, 6th Edition, Tata McGraw-Hill, New Delhi, 2006
2) John Bird, Electrical Circuit Theory and Technology, 3E, Elsevier, Gurgaon, India

EE 4004
ELECTRICAL MEASUREMENTS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
To make the student to have a clear knowledge about the basic laws governing the operation of electrical measuring instruments, relevant circuits and their working. This course provides complete idea about measurement of electrical quantities like Voltage, Current, Power, Energy and comparison methods of measurement of Resistance, Inductance and Capacitance. Apart from measuring electric quantities this course also provides comprehensive idea about magnetic measurements, transducers and Cathode Ray Oscilloscopes.

Learning Outcomes:
Based upon above objectives the course goals / learning outcomes are defined below.
1. Understand the concepts of analog electrical measuring instruments. Application of these concepts in measuring electrical quantities like Voltage, Current and Power.
2. Understand the concepts of measurement of Energy, Phase and Power factor. Understanding various tariffs in Industry and Industrial metering.
3. Understand the role of Instrument transformers in electrical measurements. Understanding the concepts of ratio error, phase angle errors and various testing methods of Instrument transformers. Analysing various comparison methods of measurement of Resistance, Inductance and Capacitance.
4. Understand the concepts of Ballistic Galvanometer and flux meter and application of these concepts in magnetic measurements. Understanding the construction and working principle of Cathode Ray Oscilloscope and application of these concepts in measurement of electrical quantities and analysing various transducers.

Unit I

ANALOG INSTRUMENTS: [Text Book - 1]
Classification of analog Instruments, principles of operation.
Electro-Mechanical indicating instruments – operating forces, control systems, damping systems, pointers and scales.

ANALOG AMMETERS AND VOLTMETERS: [Text Book - 1]
Permanent Magnet Moving Coil Instruments, Moving Iron Instruments, Electrodynamometer Instruments, Electrostatic Instruments. (Construction, General Torque equation, shape of scale, Advantages, disadvantages, errors and extension of ranges)

MEASUREMENT OF POWER AND WATTMETERS: [Text Book - 1]
Power in DC circuits, power in AC circuits
Electrodynamometer wattmeters – Construction, theory, shape of scale, errors. Low power factor dynamometer wattmeters.
Power in poly phase systems, Measurement of power in three phase circuits, three phase wattmeters, Measurement of Reactive power.

Unit II

MEASUREMENT OF ENERGY AND INDUSTRIAL METERING: [Text Book - 1]
Energy meters for A.C circuits, theory of Induction type meters, Single phase Induction type Watt-hour meters, Poly phase Energy meters, Industrial metering and Tariffs, Maximum demand Indicators, Measurement of VAh and VARh, Testing of Energy meters.

MEASUREMENT OF PHASE AND FREQUENCY: [Text Book - 1]

Power Factor meters – Single phase Electrodynamometer Power Factor meter, three phase Electrodynamometer Power Factor meter, and Moving Iron Power Factor meters.

Frequency meters – Mechanical Resonance type Frequency meter, Electrical Resonance type Frequency meter, Weston type Frequency meter, Ratiometer type Frequency meter, Saturable core Frequency meter.

Synchroscopes – Electrodynamometer type Synchroscopes, Moving Iron Synchroscopes. Phase sequence Indicators.

Unit III

INSTRUMENT TRANSFORMERS: [Text Book -1]

Use of Instrument Transformers, Ratios of Instrument Transformers, Burden of an Instrument Transformer.

Current Transformers – Theory, Ratio error and phase angle errors, Reduction of errors, construction of C.T, effect of Secondary open circuit, permanent magnetization and demagnetization of cores, testing of Current Transformers.

Potential Transformers - Theory, Ratio error and phase angle errors, Reduction of errors, Construction of P.T, testing of Potential Transformers.

D.C & A.C BRIDGES: [Text Book -1]

Measurement of Resistance - Wheatstone bridge, Kelvin double bridge.

Measurement of Self Inductance - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge.

Measurement of Capacitance – DeSauty's bridge, Schering bridge, High voltage Schering bridge.

Unit IV

MAGNETIC MEASUREMENTS: [Text Book -1]

Ballistic Galvanometer – Construction, theory of operation and calibration.

Flux meter – Construction and theory of operation.

Ballistic tests – Measurement of Flux density, Measurement of value of Magnetising Force (H), Testing of Ring specimens, determination of B-H curve, determination of Hysteresis loop.

Alternating Current Magnetic testing – Iron loss curves, separation of Iron losses, Wattmeter methods of Iron loss measurement.

TRANSDUCERS: [Text Book -1]

Principles of transducers, Resistance Thermometers, Thermistors, Thermo couples, Strain Gauge and Linear Variable Differential Transformers.

CATHODE RAY OSCILLOSCOPES: [Text Book -1]

Construction and operation, deflection mechanism, time base circuits, vertical amplifiers. Observation of waveforms on CRO, Measurement of Voltages and Currents, Measurement of Phase and Frequency. Dual trace Oscilloscopes, Dual beam Oscilloscopes, Digital storage Oscilloscopes.

Accessories of Oscilloscopes – Calibrators and probes.

Learning Resources:

A. Text Books:

1) A.K.Sawhney, A course in Electrical & Electronic Measurements and Instrumentation, Dhanapthirai & Co., New Delhi, 2009.

B. Reference Books:

1) J.B.Gupta, A course in Electronic & Electrical Measurements and Instrumentation, S.K.Kataria & Sons., New Delhi, 2009.
2) E.W.Golding and F.C.Widdis, Electrical Measurements and measuring instruments, 5/E, Wheeler Publishers, New Delhi, 2009.

EE 4005

TRANSFORMERS & INDUCTION MOTORS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

To develop knowledge on Principles & operation, construction, performance, maintenance & testing of transformers. Further acquiring knowledge on construction, principle and operation, performance and testing of 3-ph and 1-ph induction motors

Learning Outcomes:

Enable the students to have a fair knowledge about the construction and operation of single phase and three phase transformers and induction motors. Students will be in a position to test and analyse the performance of these machines.

Unit – I

TRANSFORMERS:

Constructional features of transformers, ideal transformer, EMF equation, no load and load phasor diagram, equivalent circuit of single phase transformers. Regulation, losses, efficiency and all day efficiency, testing of transformers: OC & SC tests, Sumpner's test

Unit – II

Auto transformers, 3 phase transformer windings and its connections star-star, star-delta, delta-star, delta-delta , zig-zag and Vector grouping. Open delta, Tertiary transformer winding, Scott connected transformers, Parallel operation of transformer with equal and unequal voltage ratios and its load sharing. Tap changing, methods of cooling

Unit - III

POLYPHASE INDUCTION MOTORS:

Rotating magnetic field in two phase & three phase systems, construction and operation of squirrel cage and slip ring 3-phase induction motors, torque equation and torque slip characteristics, equivalent circuit, losses, efficiency, testing of induction motors and circle diagram.

Types of starters, speed control of induction motors-pole changing, cascade connection, injection of emf into rotor circuit (qualitative treatment only). Crawling and Cogging, Double cage rotors, Induction generators and their applications.

Linear Induction Motors:

Principle, operation and applications of Linear Induction motors.

Unit – IV

SINGLE PHASE INDUCTION MOTORS:

Double field revolving theory, starting methods – split phase, capacitor start and run, shaded pole motors and their characteristics and applications, equivalent Circuit.

DESIGN OF SINGLE PHASE TRANSFORMER:

Dimensions of core and windings of Single Phase Transformers, No Load Current Estimation

Learning Resources:

Text Books:

1. Performance & Design of AC Machines by M.G.Say.BPB Pub.,
2. Electric Machinery by P.S.Bhimbra, Khanna Pub.,

Reference Books:

1. Theory of Alternating current machinery by Langsdorf, TMH
2. Electrical Machines by I.J.Nagrath and D.P.Kothari,7/E.TMH-2005

EE 4051
ELECTRICAL NETWORKS AND MACHINES LABORATORY – II

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Objective:

This laboratory course will give a thorough knowledge about the transformers, induction motors, and also helpful for analysis of circuits using software tools P-SPICE and MATLAB

Learning Outcomes:

The students will be in a position to find Z and Y parameters of given two port network and able to analyse the performance of 1-Ø transformers and 3-Ø induction motors by conducting various experiments on them. Also students will be in a position to use P-SPICE and MATLAB software tools to analyse electrical circuits.

List of Experiments

1. Determination of Z, Y parameters of a given two port network
2. OC & SC tests on single - phase transformer
3. Load test on single - phase transformer
4. Sumpner's test on Transformers
5. Scott Connection of Transformers
6. Parallel Operation of Two Single - Phase Transformers
7. Load test on 3-phase transformer
8. Load test on 3 - phase squirrel cage induction motor
9. Load test on 3 - phase slip ring induction motor
10. No load and Blocked rotor test on 3 - phase induction motor
11. Brake test on single - phase induction motor
12. Determination of Equivalent Circuit of Single - Phase Induction Motor
13. Simulation of RLC circuits using PSPICE
    i) Steady state analysis ii) transient analysis
14. Verification of Thevenin and Norton theorems using P-SPICE
15. Verification of Maximum power transfer and superposition theorems using P-SPICE
16. Solving of differential equations using MATLAB
17. Study of two mesh transient problem using MATLAB

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE 4052
ELECTRICAL MEASUREMENTS LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course Objective:
To develop on hand experience with DC & AC bridges, CRO, oil Test Kit, single phase and three phase energy meters, transducers like LVDT & Strain Gauge to measure different electrical parameters like resistance, inductance, capacitance, frequency, power, energy and dielectric strength.

Learning Outcomes:
The students will be able to measure resistance, inductance, capacitance and frequency using various DC & AC bridges. The students will also know about measuring techniques of active power, reactive power and energy in electrical industry. They will be in a position to use CRO, oil test kit and transducers like LVDT and Strain gauge effectively for measuring different quantities.

Topics/Syllabus:

LIST OF EXPERIMENTS:

1. Measurement medium resistance using Wheatstone Bridge.
2. Measurement low resistance using Kelvin's Double Bridge.
3. Measurement of earth resistance by fall of potential method and earth tester.
4. Measurement of capacitance and loss tangent using Schering Bridge.
5. Measurement of Inductance and Quality factor using Anderson Bridge.
6. Calibration of single–phase energy meter by direct loading.
7. Calibration of single–phase energy meter by phantom loading
8. Measurement of displacement using LVDT
9. Measurement of strain using strain gauge
10. Measurement of dielectric strength of transformer oil
11. Measurement of frequency using CRO
12. Tracing of B-H curve using CRO
13. Measurement of 3-phase reactive power with single Wattmeter
14. Frequency measurement by Wien's Bridge
15. Measurement of 3-phase power using 3-Voltmeter and 3-Ammmeter methods
16. Measurement of Ratio error and Phase angle error of C.T

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE 4053
COMMUNICATION SKILLS LABORATORY

Lecture	: -	**Internal Assessment**:	75*
Tutorial	: -	**Final Examination**:	-
Practical	: 3 hrs/ week	**Credits**:	2

Course work is framed to improve the communication Skills and Language Skills of the students and award marks based on Internal Assessment

*25 Marks for continuous assessment and 50 marks for final presentation evaluated internally.

EE/EI 5001
LINEAR CONTROL SYSTEMS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objective:
To describe what is feedback control and basic components of control systems, describe the various time domain and frequency domain tools for analysis and design of linear control systems, describe the methods to analyze the stability of systems from transfer function forms.

Learning Outcomes:
- describe what feedback control is, basic components of control systems
- analyze the stability of systems from transfer function forms
- describe the various time domain and frequency domain tools for analysis and design of linear control systems
- Tune PID controller
- design compensators
- apply the modern control concepts using state approach

UNIT I

INTRODUCTION:
Control system terminology, examples of simple control systems, open loop and closed loop control systems, effect of feedback on overall gain, stability, sensitivity, external noise; types of feedback control systems - linear time invariant and time varying, nonlinear and discrete.

MATHEMATICAL MODELS OF PHYSICAL SYSTEMS:
Formulation of differential equations for electrical, mechanical and electromechanical systems, analogous systems, transfer functions of open and closed loop systems, characteristic polynomial and characteristic equation of feedback systems, poles and zeros, block diagram representation of control systems, block diagram algebra, signal flow graph, Mason's gain formula

CONTROL SYSTEM COMPONENTS:
Synchros, potentiometers, dc and ac servomotors, tachogenerators

UNIT II

TIME DOMAIN ANALYSIS:
Standard test signals – step, ramp, parabolic and impulse; Time response of first-order system to standard test signals, step response of second order system, time domain specifications; steady state error and error constants;
On-off, P, I, PI, PD and PID control actions, tuning of PID controllers – Ziegler-Nichols method.

STABILITY ANALYSIS IN COMPLEX PLANE:
Stability definitions - BIBO, Impulse response, Asymptotic. Stability study based on poles of closed-loop transfer function, absolute & relative stability, Routh–Hurwitz criterion.

UNIT III

ROOT LOCUS TECHNIQUE:

The root locus concept, magnitude and angle conditions, properties and construction of the root loci (**For positive K only**)

FREQUENCY DOMAIN ANALYSIS:

Introduction, frequency domain specifications, correlation between time and frequency response, polar (Nyquist) plot, Bode plot, magnitude vs phase plot; phase margin and gain margin - stability inferences; Nyquist stability criterion.

UNIT IV

FREQUENCY-DOMAIN DESIGN OF CONTROL SYSTEMS:

Introduction, phase-lead controller, lead compensation technique based on the frequency response approach; phase-lag controller – lag compensation technique based on the frequency response approach.

STATE SPACE ANALYSIS:

Concepts of state, state variables, phase variables, canonical variables, state vector, input vector, output vector; development of state models for simple systems, solution of state equation, the state transition matrix and its properties; characteristic equation and transfer function from state models, Eigen values and Eigenvectors. Diagonalization, transformation to phase variable canonical form, diagonal canonical form, Jordan canonical form. Concepts of controllability and observability.

Learning Resources:

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Modern control Engineering by K.Ogata 5/E PHI
2. Automatic control systems by B.C.Kuo. 7/E, PHI
3. Feedback and control systems by Schaum's Series 2/E TMH

EE 5002
ANALOG ELECTRONICS – II

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

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

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

Unit-I

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

Unit-II

FEED BACK AMPLIFIERS:
Classification of amplifiers, Feedback concept, Negative feedback amplifiers and their characteristics, Different topologies, Stability in General.

OSCILLATORS:
Barkhausen Criterion, RC phase shift oscillator, Wein bridge, Hartley, Colpitt's oscillators using transistors, Frequency stability, Crystal oscillators.

Unit-III

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

MULTIVIBRATORS (USING BJTS):
The Bistable multivibrator, Schmitt trigger circuit, comparative study of Bistable, Monostable and Astable multivibrators.

Unit-IV

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

SWEEP CIRCUITS:
Voltage sweep circuits, current charging, voltage sweep circuits, current sweep circuits, need for a trapezoidal waveform for linearity correction, its generation and application.

Learning Resources:

TEXT BOOKS:
1. Integrated Electronics by Millman & Halkias
2. Electronic Circuits, Discrete and Integrated by Schilling and Belove

REFERENCE BOOKS:
1. Electronic fundamentals and applications, Integrated and Discrete by John D. Ryder
2. Pulse and digital circuits by Anand Kumar

EE/EI/EC5003
ENGINEERING ECONOMICS & MANAGEMENT

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	3

Course Objective:
At the end of the course the students should be able to understand different types of business organizations and the various scientific principles used in different departments like personnel department, financial department, marketing department etc. The student should also be able to understand basic economic principles and strategies.

Learning outcomes
The student will be ready to apply the different scientific methods used in various departments of any organization like finance department, marketing department, and personnel department. He will also be aware of the basic economic concepts.

Course contents:

UNIT – I

GENERAL MANAGEMENT:
Principles of scientific management, brief treatment of managerial functions: planning, organizing, staffing, directing, coordinating and controlling, Modern Principles of Management

FORMS OF BUSINESS ORGANIZATION:
Salient features of sole proprietorship, partnership, joint stock company: private limited and public limited companies.

PERSONNEL MANAGEMENT:
The personnel function, functions of a personnel management, job evaluation – Methods

UNIT – II

MANAGERIAL ECONOMICS:
Introduction, Basic Economic concepts, Supply and Demand Law of Diminishing Utility, Marginal Utility and Total Utility, Law of Equi marginal utility, Demand Analysis , Demand Schedule and Demand Curve, Factors influencing Demand, Shift in Demand, Demand Function, Supply Schedule and Supply Curve, Factors influencing Supply, Equilibrium of Supply and Demand, Elasticity of Demand, Elastic and Inelastic Demand, Production function, Factors of production, Isoquants (Equal Product Curves), Least cost combination of inputs for a given output, Cost output relationship (Theory of Cost). Relationship between ATC and MC, Relationship between AC and MC. Theory of Firm, Profit maximization under perfect competition and under monopoly, Returns to scale.

UNIT – III

WORK STUDY:
Introduction, Management techniques to reduce work content and ineffective time.

METHOD STUDY:
Procedure, Tools for recording information: charts and diagrams, use of fundamental hand motions (Therbligs), principles of motion economy, SIMO chart, cycle graph and chrono cycle graph.

WORK MEASUREMENT:
Objectives and techniques, time study methods and rating systems. Allowances: Standard time.

UNIT – IV
MARKETING MANAGEMENT:
Concept of selling and marketing – differences, functions of marketing, market research, advertising and sales promotion, break-even analysis, distribution channels – types, product life cycle.
FINANCIAL MANAGEMENT:
Functions of financial management, simple and compound interest, Methods of evaluating alternatives- Present Worth method. Future worth Method, Annual equivalent method. Depreciation, common methods of depreciation: straight line method, declining balance method, sum of year's digits method.

Learning Resources:

TEXTBOOKS

1. Introduction to work study-ILO
2. Industrial& business management- MarthandT & Telsang

REFERENCE BOOKS

1. Personnel Management- Tripathi and Reddy
2. Engineering economy- Theusen & Theusen

WEB REFERENCE

www.tectime.com
www.exinfm.com
www.slideshare.net
www.economywatch.com

EE5004

MICROPROCESSORS & MICROCONTROLLERS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course objectives

This course will introduce the students to the fundamentals of computer architecture, 8086 architecture, 8086 programming in assembly language, and knowledge in interfacing devices, the concepts of microcontrollers and their applications.

Learning Outcomes:

After successful completion of the course, the students will be able to gain knowledge of the history and structure of Microprocessors, and describe basic microprocessor architecture, physical and the logical configuration of memory. The learner will be able to differentiate between microprocessor and microcontroller and can select best suited microprocessor / microcontroller for specified application.

UNIT I

8086 MICROPROCESSOR: Introduction to Microcomputers and Microprocessors, Introduction to 8086 microprocessor family, 8086 internal architecture, Addressing modes, 8086 Instruction descriptions.

UNT II

8086 PROGRAMMING AND SYSTEM CONNECTIONS: Program development steps, assembly language program development tools, programming the 8086, writing and using procedures and assembler macros. 8086 minimum mode system, addressing memory and ports in 8086 system, 8086 interrupts and interrupt responses.

UNIT III

PROGRAMMABLE DEVICES AND INTERFACING: 8255 block diagram description, modes of operation, 8253/8254 modes of operation, 8259 Block diagram description, interfacing a microprocessor to keyboards, interfacing a A/D and D/A converter to microprocessor, the DMA data transfer.

UNIT IV

THE 8051 MICROCONTROLLER: Introduction to microcontrollers, comparing microprocessors and microcontrollers, over view of the 8051 family, the 8051 architecture: 8051 microcontroller hardware, input/ output pins, ports and circuits, external memory, counters and timers, serial data input/output and interrupts.

Learning Resources:

Text Books

1. Douglas V Hall, Microprocessor and Interfacing: Programming and Hardware, 2ND Edition, TMH, 2003
2. Kenneth. J.Ayala, The 8051 Microcontroller Architecture, Programming and Applications, Penram International 2nd edition, 1996

Reference Books

1. Yu-cheng Liu, Glenn A Gibson, Microcomputer systems: The 8086/8088 Family, Architecture, Programming and Design, 2nd Edition, PHI, 2003.
2. Barry B Brey, The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV: Architecture, Programming and Interfacing, 6th Edition, PHI, 2003

EE 5005
GENERATION OF ELECTRICAL POWER

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	3

Course objective:
To impart knowledge about the generation of electrical power to meet the ever increasing demand of electrical power and operation of conventional power plants.

Learning outcomes:
Enable the students to have a fair knowledge about
1. The choice of selection of power plants and the layout and working of steam power stations.
2. The layout and working of Gas Turbine Stations and Nuclear Power Stations.
3. The layout and working of Hydro Power Stations.
4. The economic aspects of the generation of the power, and various types of Tariff.

Unit – I

INTRODUCTION: [Ref. Book - 1]

Electrical energy demand, electrical energy growth in India, growth of electrical energy consumption, electrical energy losses, electrical energy sources, coal, liquid fuels, gaseous fuels, nuclear fuels, transport of fuel or electricity, power crisis in India, organization of power sector in India, future energy demands in India.

STEAM POWER PLANTS: [Text Book - 1]

Introduction, classification of steam power plants, layout of a modern steam power plant, essential requirements of steam power station design, selection of site for steam power station, capacity of steam power plant, choice of steam conditions, fuel handling, combustion equipment for steam boilers, fluidized bed combustion, ash handling, dust collection, boilers. Steam turbines – Introduction, classification, advantages of steam turbines over steam engines, description of common types of turbines, methods of reducing wheel or rotor speed, difference between impulse and reaction turbines, steam turbine governing and control. Steam condensers, feed water treatment, advantages and disadvantages of steam power plants.

Unit – II

GAS TURBINE POWER PLANTS: [Text Book - 1]

Gas turbines - general aspects, applications of gas turbine plants, advantages and disadvantages of gas turbine power plants over Diesel and Thermal power plants, site selection, simple gas turbine plant, energy cycle for a simple-cycle gas turbine, performance terms, classification of gas turbine power plants, classification of gas turbines, combination gas turbine cycles, operation of a gas turbine, gas turbine power plant layout, components of a gas turbine power plant, various arrangements of gas turbine power plants.

NUCLEAR POWER PLANTS: [Text Book - 1]

General aspects of Nuclear Engineering: Nuclear structure, atomic mass unit, isotopes, radioactivity, nuclear radiation, binding energy, radioactive decay, nuclear reactions, nuclear cross-sections, fertile materials, fission of nuclear fuel, comparison of fission and fusion processes, nuclear reactors-introduction, classification and essential components. Power of a nuclear reactor. Main components of a nuclear power plant, description of reactors - pressurized water reactor (PWR), boiling water reactor (BWR), Canadian-Deuterium-Uranium (CANDU) reactor, gas cooled reactor, liquid metal cooled reactors, breeder reactors. Selection of materials for reactor components, advantages and disadvantages of nuclear power plants, nuclear power plant site selection, and nuclear power plants in India.

Unit – III

HYDRO-ELECTRIC POWER PLANTS: [Text Book - 1]

Introduction, applications of Hydro-electric plants, advantages and disadvantages of Hydro-electric plants, selection of site for Hydro-electric plant, essential features of Hydro-electric power plant, classification of Hydro-electric power plants. Hydraulic turbines – classification, description, specific speed and efficiencies of turbines, cavitation, performance of hydraulic turbines, governing of hydraulic turbines, selection of turbines. Plant layout, hydro-plant auxiliaries, cost of hydro-plant, average life of hydro-plant components, hydro-plant controls, electrical and mechanical equipment in a hydro-plant, combined hydro and steam power plants, comparison of Hydro-power station with thermal power stations, underground hydro-plants, automatic and remote control of hydro-stations, safety measures in hydro- plants, preventive maintenance of hydro-plants, calculation of available hydro-power, cost of hydro-power. Hydrology – Introduction, hydrologic cycle, measurement of run-off, hydrograph, flow duration curve, mass curve.

Unit – IV

COMBINED OPERATION OF DIFFERENT POWER PLANTS: [Text Book - 1]

General aspects, advantages of combined operation of plants, load division between power stations, Hydro-electric (storage type) plant in combination with steam plant, Run-of-River plant in combination with steam plant, pump storage plant in combination with steam or Nuclear power plant, co-ordination of Hydro-electric and gas turbine stations, co-ordination of different types of power plants.

ECONOMIC CONSIDERATIONS: [Text Book - 2]

Introduction, classification of costs, cost analysis of power plants, interest and depreciation, methods of determination of depreciation, economics of power generation, significance of load factor and diversity factor, load sharing between base load and peal load plants, choice of size and number of generating units, tariffs, types of tariffs, types of consumers and their tariffs, power factor, disadvantages of low power factor, causes of low power factor, methods of power factor improvement, advantages of power factor improvement, economics of power factor improvement, economical comparison of the two methods of increasing the power supplied, choice of equipment.

Learning Resources:

A. **Text Books:**

1. R.K.Rajput, Power System Engineering, Laxmi Publications Pvt., ltd.
2. J.B.Gupta, A Course in Power Systems, S.K.Kataria publications.

B. Reference Books:

1. B.R.Gupta, Generation of Electrical Energy, Chand publications
2. A Course in Electric Power by Soni, Gupta and Bhatnagar

EE 5006
SYNCHRONOUS & SPECIAL MACHINES

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:
To develop knowledge on Principles & operation, construction, performance, maintenance & testing of Synchronous Machines. Further acquiring knowledge on construction, principle and operation, performance of AC series motors, Repulsion motors, Reluctance motors, Hysteresis motors and Stepper motors.

Learning Outcomes:
Enable the students to have a fair knowledge about the construction and operation of synchronous machines and special machines. Students will be in a position to test and analyse the performance of these machines.

Unit – I

SYNCHRONOUS GENERATORS:

Construction, EMF equation with sinusoidal flux, winding factors, harmonics in generated voltage and their suppression, armature leakage flux, armature reaction, synchronous impedance, vector diagram, load characteristics, methods of determining regulation – direct load, EMF, MMF, ZPF and ASA, losses and efficiency

Unit – II

Blondel two reaction method for salient pole machine, phasor diagram, slip test, regulation of salient pole machines, parallel operation, synchronizing with infinite bus bars, synchronizing current, synchronizing power, expression for power, power angle characteristics, short circuit on 3-phase alternator, effect of variation of excitation and mechanical input on parallel operation, load sharing

Unit – III

SYNCHRONOUS MOTOR:

Theory of operation, starting methods, phasor diagrams, variation of current and power factor with excitation - minimum and maximum power for a given excitation and power circles, V and inverted V curves, hunting – its prevention, synchronous condenser and its application.

Unit – IV

SPECIAL MACHINES:

Principle of operation, characteristics and applications of reluctance motor, hysteresis motor, AC series motors and repulsion motors.

Stepper motors - Variable reluctance stepper motor, permanent magnet stepper motor and hybrid stepper motor and their applications.

Learning Resources:

Text Books:

1. Theory of A.C Machines by A.E.Langsdorf, TMH
2. Electric Machines by D.P.Nagarath & I.J.Kothari 7/E TMH-2005

Reference books:

1. Electrical Machinery by Fitzgerald, Kingsley and S.D.Umans (5^{th} Ed),MGH
2. Performance and Design of A.C.Machines by M.G.Say, BPB Publishers
3. Electrical Machines by P.S.Bimbra, khanna Publishers

EE 5051
AC MACHINES LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course Objective:
To develop on hand experience with synchronous generators and motor by allowing them to conduct various experiments on synchronous machines.

Learning Outcomes:
The students will know to calculate the regulation of alternators by various methods, load sharing, floating of alternator, performance of motors, measurement of Xd & Xq parameters, parallel operation of transformers etc.

LIST OF EXPERIMENTS:

1. Load test on alternator
2. Regulation of alternator by synchronous impedance & mmf methods
3. Regulation of alternator by ZPF method
4. Measurement of X_d and X_q of a 3 - phase alternator
5. Synchronization of alternator with infinite bus
6. Parallel operation of two synchronous machines
7. V and inverted V curves of synchronous motor
8. Synchronous motor performance
   i) With constant excitation ii) With constant load
9. Separation of losses in single-phase transformer
10. Separation of losses in 3-phase induction motor
11. Load test on Induction generator
12. Harmonics analysis of transformer
13. Parallel operation of two-3phase transformers
14. Load test on Universal motor
15. Performance characteristics of Schrage motor.
16. Simulation of various motors and generators by SIMULINK

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE 5052
ELECTRONICS LABORATORY – II

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course Objective:
To make Students understand the characteristics of the various amplifiers, voltage regulators oscillators and multivibrators.

Learning Outcomes:
After successful completion of this course students will be able to analyse and design various amplifiers, voltage regulators, oscillators and multivibrators.

LIST OF EXPERIMENTS:

1. Two stage RC coupled Amplifier
2. Design of voltage shunt feedback amplifier
3. Class B push pull amplifier
4. Complementary symmetry amplifier
5. Design of RC phase shift oscillator
6. Design of LC oscillator
7. Design of series voltage regulator
8. Linear wave shaping
9. Non-linear wave shaping
10. Bistable multivibrator
11. Monostable multivibrator
12. Astable multivibrator
13. Schmitt trigger
14. UJT relaxation oscillator
15. Blocking oscillator

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

EE 5053
ELECTRICAL WORKSHOP

Lecture	: -	**Internal Assessment**:	75*
Tutorial	: -	**Final Examination**:	-
Practical	: 2 hrs/ week	**Credits**:	1

Course objective:
To provide students an opportunity to troubleshoot and design various lamps, motors and generators commonly used in industry. This course also provides the students hands on experience in testing of various electronic components and fabrication of various electronic circuits.

Learning Outcomes:
Enable the students to have a fair knowledge about the operation and troubleshooting of various lamps, motors and generators. This course also enables the student to test various electronic components and design various electronic circuits.

LIST OF EXPERIMENTS:

1. Study and troubleshooting of various lamps
2. Study and troubleshooting of fractional horse power motors
3. Troubleshooting of Generators and Motors
4. Design and fabrication of choke coil
5. Study of various types of electrical installation earthing procedures.
6. Design of small Transformers
7. Design of cables for Industrial hall
8. Design of Industrial Hall Lighting
9. Study of Layout of Substation
10. Electronic component testing
11. Design and fabrication of rectifiers with filters
12. Fabrication of PCB
13. Design and fabrication of Adders
14. Design and fabrication of Counters
15. Design and fabrication of oscillators

NOTE: In all laboratories a minimum of 10 experiments are to be completed.

*25 Marks for continuous assessment and 50 marks for final examination evaluated internally.

EE/EC 6001
INTEGRATED CIRCUITS AND APPLICATIONS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objectives:

- To enable the students to understand the fundamentals of integrated circuits and designing electronic circuits using these integrated circuits.

Learning Outcomes

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

UNIT - I

Operational Amplifier:

Introduction, Basic Information of Op-amp, The ideal Operational Amplifier, Operational Amplifier Internal Circuit, FET Operational Amplifier.

Operational amplifier characteristics: Introduction, DC characteristics, AC characteristics.

Operational amplifier Applications: Introduction, Basic Op-amp Applications, Instrumentation Amplifier, AC amplifier, V to I and I to V converter, Op-amp Circuits using Diodes, Sample and Hold Circuits, Log and Antilog amplifier, Differentiator, Integrator.

UNIT – II

Comparators and Waveform Generators:

Introduction, Comparator, Regenerative Comparator (Schmitt Trigger), Square Wave Generator (Astable Multivibrator), Monostable Multivibrator, Triangular Wave Generator, Basic Principles of Sine Wave Oscillators.

Active Filters:

Introduction, RC active filters, Transformations, State Variable Filter

UNIT – III

D-A and A-D Converters:

Introduction, Basic DAC Techniques A-D Converters, DAC/ADC specifications

Voltage Regulators: Introduction, Series Op-amp Regulator, **D**esign and Analysis of Series and Shunt Regulators using Discrete Components, Protection Techniques, Switching Mode Power Supply, UPS. IC Voltage Regulators, 723 General Purpose Regulators

UNIT – IV

Applications of Special ICs:

555 Timer: Introduction, Description of Functional Diagram, Monostable operation, Astable Operation, Schmitt Trigger.

Phase Locked Loops: Introduction, Basic Principles, Phase Detector/Comparator, Voltage Controlled Oscillator (VCO), Low Pass Filter, Monolithic Phase Locked Loop, PLL Applications.

Learning Resources:

Text Book:

1. D. Roy and Choudhury, Shail B. Jain, Linear Integrated Circuits, 4th Edition, New Age International (P)Limited, 2010. (Units : I, II, III, IV)

Reference Books:

1. Denton J Dailey, "Operational Amplifiers and Linear Integrated Circuit Theory and Applications", McGraw-Hill, 1989.
2. J. Michael Jacob, "Applications and Design with Analog Integrated Circuits", 2nd Edition, PHI, 2003.
3. Ramakanth A. Gayakwad, "Op-amps and Linear Integrated circuits", 3rd Edition, PHI, 2001.
4. Jacob Millman and Christos C Halkias., "Integrated Electronics", TMH.

Web Resources:

1. http://en.wikipedia.org/wiki/Integrated_circuit
2. http://www.electronics-tutorials.ws/opamp/opamp_1.html
3. http://frankshospitalworkshop.com/electronics/documents/Electronic_Devices_And_Circuits.pdf

EE/EI 6002
FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objectives:

- To study DFT and its computation
- To study the design techniques for digital filters

Learning Outcomes:

After completing this course, students will be able to:

- Analyze signals using the discrete Fourier transform (DFT), understand circular convolution, its relationship to linear convolution, and how linear convolution can be achieved via Discrete Fourier Transform, understand the Decimation in Time and Frequency FFT algorithms for efficient computation of the DFT.

- Design digital IIR filters by designing prototypical analog filters and then applying analog to digital transformation techniques, Design digital FIR filters using windows, Realizing digital filters in : direct form I, direct form II, parallel, and cascade forms, and understand the finite precision effects such as input quantization, coefficient quantization, and multiplication round off.

Course Content

UNIT-I

Discrete Signals and Systems:

Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems

Z-Transforms:

Z-transforms, Region of convergence, Z-transform theorems and properties, Relation between Z-transform and Fourier transform of a sequence, Inverse Z-transform using Cauchy's integration theorem, Partial fraction method, Long division method, Solution of difference equations using one sided Z-transform, Frequency response of a stable system.

UNIT-II

DFT and FFT:

Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT

UNIT-III

IIR Filter Design Techniques:

Introduction, Properties of IIR filters, IIR filter design using bilinear transformation and impulse invariance methods; Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method.

UNIT-IV

FIR Filter Design Techniques

Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: Rectangular window, Hanning window, Hamming window, Generalized Hamming window, Bartlett triangular window, Comparison of IIR and FIR filters.

Realization of Digital Filters

Direct, Canonic, Cascade, Parallel and Ladder realizations

Learning Outcomes:

Text Books

1. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education/PHI, 2004 (UNIT-I)
2. Proakis, J. Gard and D. G. Manolakis, Digital Signal Processing : Principals, Algorithms and Applications , 3rd Edn.,, PHI, 2003 (Unit-II, III, IV)

Reference Books

1 M.H.Hayes, Digital Signal Processing, TMH
2 P.Ramesh Babu, Digital Signal Processing, 2nd Edition, Scitech Publications, 2004.
3 S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003
4 Digital Signal Processing - S.Salivahanan., TMH,2000.

Web Resources

1. **www.dsptutor.freeuk.com**
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR/Digi_Sign_Pro/ui/About-Faculty.html

EE 6003
SWITCHGEAR AND PROTECTION

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Course objectives:

This course introduces to students various protection schemes of electrical equipment like generator, transformer and transmission lines. This course focuses on study of various types of electromagnetic and static relays. It also covers principle and operation of various types of circuit breakers and their ratings. This course will also describe substation protection and the need of neutral grounding / earthing in electric power systems.

Learning Outcomes:

After completing this course, students will be able to:

1. Understand concepts and working of different types of switchgear.
2. Understand the principle and working of different circuit breakers and relays.
3. Learn various protection schemes of power system components.
4. Understands the concepts of over voltage protection and the need of neutral grounding and power system earthing.

UNIT-I:

SWITCHGEAR – GENERAL ASPECTS: Definition, Functions, Essentials, principles of layout and types of switchgear, short-circuits in electrical installations and limiting methods.
Switches - Definition and classes of switches.
FUSES: Definition, advantages, disadvantages and desirable characteristics of Fuses. Fuse element materials, important terms relating to fuses, types of fuses, Fuse selection, differences between sub-circuit fuses, main circuit fuses, meter board fuses and pole fuses in an Electrical Installation.
CIRCUIT BREAKERS: Introduction, Function and principle of operation of circuit breakers, Arc phenomenon, Methods of arc extinction, Arc, restriking and recovery voltages, current chopping, resistance switching, classification of circuit breakers, oil circuit breakers, water type circuit breakers, Air blast circuit breakers, SF_6 circuit breakers, Vacuum circuit breakers, Low voltage circuit breakers, Ratings of circuit breakers, testing of circuit breakers, Auto reclosing, maintenance of circuit breakers.

UNIT – II:

ELECTROMAGNETIC RELAYS:
Introduction, basic characteristics of the protective systems, relay operating principle, basic relay contact connections, primary and backup protection, classification of relays, Electromagnetic attraction relays, Thermal relay, Buchholz relay, Electromagnetic Induction relays, Induction type non-directional over current relay, Induction type directional power relay, Induction type directional over current relay, differential relays, translay relay, Impedance relays, reactance type distance relay, Mho type distance relay, universal torque equation.

STATIC RELAYS:
Introduction, Merits and demerits of static relays, applications of static relays, electronic circuits commonly used in static relays, analog circuits commonly used in static relays, Static over current and Differential relays, static relays verses Electromagnetic Relays.

UNIT –III:

PROTECTION OF ALTERNATORS:
Types of faults in Alternators, protection against stator faults by percentage differential relays, Balanced earth fault protection, stator inter-turn protection, unbalanced loading of the alternator, over current protection, failure of prime-mover, over voltage protection, restricted earth fault protection, stand-by earth fault protection, rotor fault protection.

PROTECTION OF TRANSFORMERS:
Buchholz protection, core-balance leakage protection, combined leakage and overload protection, differential protection for transformers, Interlocked over current protection in the transformer protection scheme.

PROTECTION OF BUS-BARS AND LINES/FEEDERS:
Introduction, differential bus-bar protection, fault bus protection, requirements of line protection, protection schemes for lines/feeders - time graded over current protection, differential protection and distance protection.

UNIT–IV:

PROTECTION AGAINST OVER VOLTAGES:
Causes of over voltages, Lightning Phenomena, Protection of Transmission Lines and Substations against Lightning strokes, Protection against traveling waves, Rod gaps, different types of arrestors and surge absorbers.

NEUTRAL GROUNDING:
Introduction to Neutral grounding, advantages - solid, resistance and reactance grounding, Arc suppression coil.

POWER SYSTEM EARTHING:
Objectives, definitions, tolerable limits of body currents, soil resistivity and earth resistance.

SUBSTATION PROTECTION:
Substation layout showing the location of potential transformers, current transformers, lightning arrestors, earth switches, isolators, circuit breakers and auxiliaries.

Learning Resources:

TEXT BOOKS

1. R.K.Rajput, A text book of Power System Engineering, Laxmi Publications (P) Ltd., NewDelhi
2. S.Sivanagaraju, S.Satyanarayana, Switchgear and Protection, Ridge publications,Hyd.

REFERENCE BOOKS

1. Sunil.S.Rao, Switchgear and Protection, Khanna Publishers, New Delhi
2. Badri Ram & D.N.Vishwakarma, Power System Protection and Switchgear, *TMH*
3. Wadhwa.C.L., Electrical power systems, New age international (P) Ltd., publishers

EE 6004
TRANSMISSION & DISTRIBUTION

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:
To develop expression for computation of fundamental parameters of lines and categorize the lines into different classes and develop equivalent circuits for these classes and analyse the voltage distribution in insulator string and cables and methods to improve the same

Learning Outcomes:
1. Explain about different parts of a typical power system
2. Explain the use of high voltages in transmission of electrical power.
3. Categorize power lines by voltage and explain their applications
4. Explain functions of different parts of an overhead power line
5. Explain about different types of electrical power distribution systems and their Characteristics.

Unit–I [Text Book: 1]

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

Unit–II

TRANSMISSION LINE THEORY: [Text Book: 1]
Short, medium and long lines, regulation and efficiency, Pie, T and rigorous methods of solution, ABCD constants, sending and receiving end power equations and power circle diagrams, surge impedance loading, Ferranti effect, Corona, factors affecting corona, critical voltages and power loss; Radio interference due to Corona

MECHANICAL DESIGN: [Text Book: 1]
Mechanical design, sag and stress in overhead conductors suspended at level supports and at different levels, effect of wind and ice on sag, use of sag templates and string charts; conductor vibration-dampers

Unit–III

INSULATORS: [Text Book: 1]
Types of insulators, voltage distribution in a string of suspension insulators,

GRADING OF INSULATORS:
Failure of insulator and testing, arcing horns

UNDERGROUND CABLES:
Types of cables, laying of cables, insulation resistance, electric stress and capacitance of single core cable, use of intersheath, capacitance grading, capacitance of three core belted type cable, stress in a three-core cable, sheath effects, currents in bonded sheaths, electrical equivalent of sheath circuit, thermal characteristics of cables.

Unit–IV

DISTRIBUTION: [Ref Book: 1]

Comparison of copper efficiencies between DC, AC Single phase, 3-phase, 3-wire & 4-wire systems, calculation of voltage regulation in case of non uniform and uniformly distributed loads on feeders, feeders fed at one end and both ends, ring feeders without and with interconnections, choice of voltage and frequency, Kelvin's law for most economical cross section and most economical current density and its limitations

SUBSTATION PRACTICE: [Text Book: 1]

Classification of substations, indoor and outdoor substations, busbar arrangements – single busbar, sectionalized single busbar, main and transfer busbar system, sectionalized double busbar system, ring mains, group switching,

Learning Resources:

A. Text Books:

1. Electric power transmission and distribution by Sivanagaraju, S.Satyanarayana, Pearson Education, 2009.

B. Reference Books:

1. Electrical Power Systems by C L Wadhwa, New Age Int. 4/E
2. Transmission & Distribution of Electrical Power by J.B. Gupta, S. K. Kataria & Sons

C. Other learning materials such as computer-based programs/CD, professional Standards/regulations:

- IIT, NPTEL video lessons
- MIT video lessons

EE 6005
DATA STRUCTURES USING C++

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:
The objective of the course is to introduce the fundamentals of Data Structures, Abstract concepts and how these concepts are useful in problem solving. After completion of this course student will be able to

- Understand the structured paradigm of C++
- Understand various searching & sorting techniques
- Understand and use the process of abstraction using 'C++' programming language.
- Analyze step by step and develop algorithms to solve real world problems. Implementing various data structures viz. Stacks, Queues and Linked Lists.

Learning Outcomes:

1. Understand the Object oriented programming fundamentals and the need for C++.
2. Able to program the given problem using structured paradigm. Also able to search arrays by binary, sequential searches, insertion sort methods. Able to solve electrical circuit problems resulting in simultaneous equations.
3. Understand the concepts of Object Oriented Programming like Class, Object, Data Abstraction. Learn about Constructors and Destructors to initialize / destroy the object. Understand the concept of reusability, the concept dynamic binding. Learn methods to overload the meanings of the functions and the operators. Understand the difference between structures and classes and how the information is secure in classes. Able to program using object oriented paradigm. Able to program using multifile program construction.
4. Able to understand static and dynamic pointers, pointer arithmetic, indirection. Understand the importance of ADTs and able to program stack, queue and linked list ADTs using classes.

Unit-I
Data Abstraction, Classes, Objects
Why C++?, idea of data abstraction and classes, standard data classes in C++, Constant and variable objects, enumerated classes and objects, Structure of a C++ program, Top-down design using C++ functions, input and output objects – cin, cout, get(), getline(), gets(),fgets(); Monitor, printer outputs, formatting output; reading and writing disk files- file streams, reading and writing a disk file
Standard operations in C++ - arithmetic, assignment and Boolean operations; some standard functions in C++ - conversion, mathematical and string functions; Technical Applications- data communication and polar & rectangular coordinates

Unit-II
Review of making decisions, looping operations; Functions in depth – void & non-void functions, return data class, parameter listing, function prototypes- default parameters, function overloading; Scoping-out variables and constants, Recursion; Ohm’s law and banking applications

Arrays – structure of array, accessing array, passing arrays and array elements to functions; Applications – searching an array using sequential search, sorting an array using insertion sort and searching an array using binary search.

Multidimensional arrays

Introduction, Two and three-dimensional arrays, Simultaneous equation solution – Determinants, Crammer's rule, Electrical circuit applications

Unit-III

Classes and Objects in-depth

Structures – declaring and defining structure, storing and retrieving information using structures, nested structures – Limitations of structures through a banking application

Classes – abstract level, implementation level, Encapsulation, information hiding

Objects – defining objects,

Member functions – constructors, this pointer, access functions, messages.

Multifile program construction

Class Inheritance

Introduction

Declaring and using derived classes- single versus multiple inheritance, using #ifndef

Polymorphism and dynamic binding

Unit-IV

Pointers

Introduction, static and dynamic pointers, pointer arithmetic, indirection, using pointers as function arguments and parameters, pointers to functions, structure and object pointers.

ADTs

Introduction, ADT Stack, ADT Queue, ADT List

Learning Resources:

Text Book:

1. Structured and Object-Oriented Techniques An Introduction using C++ - Andrew C. Staugaard, Jr., Prentice Hall of India, 3/E

REFERENCE BOOKS:

1. Object Oriented Programming in C++ by Balaguruswamy, 3rd Edition, Tata McGraw-Hill.
2. C++ - How to Program – Dietel & Dietel, Pearson Education
3. Object Oriented Programming Using C++ by Barkakati, Prentice Hall India

EE 6006
POWER ELECTRONICS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
The objective of this course is to discuss the concepts of Power Semi Conductor Devices and their application areas in Electric Drives, Power Systems and their use in industries.

Learning Outcomes

After completing this course, students will be able to:

1. Understand the theory of various power electronic devices.
2. Learn the operation of controlled rectifiers and evaluate their input power factor and efficiency.
3. Learn the operation of various DC choppers and AC choppers
4. Learn the operation of various Inverters

Unit-I
POWER SEMICONDUCTOR DEVICES: [Text book-1]
Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points- Two transistor analogy – SCR - UJT firing circuit - Series and parallel connections of SCR's – Snubber circuit details – specifications and Ratings of SCR's, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutation circuits.

Unit-II
CONTROLLED RECTIFIERS: [Text book -1]
Phase control technique – Single phase Line commutated converters – Midpoint and Bridge connections– Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Freewheeling Diode –Numerical problems-Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load–Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance Derivation of load voltage and current – Numerical problems- Three phase converters – Three pulse and six pulse converters – Midpoint and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms –Numerical Problems.

Unit-III
CHOPPERS: [Text book -1]
DC Choppers: Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression Morgan's chopper – Jones chopper and Oscillation chopper (Principle of operation only) Waveforms

AC Choppers: AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits -Numerical problems - Cycloconverters – Single phase midpoint cycloconverters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cycloconverter (Principle of operation only) – Waveforms.

Unit-IV

INVERTERS: [Text book -1]

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter– Waveforms – Simple forced commutation circuits for bridge inverters – Mc Murray and Mc Murray –Bedford inverters - Voltage control techniques for inverters Pulse width modulation techniques –Numerical problems.

Learning Resources:

Textbooks:

T 1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.

T 2. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India,2nd edition, 19984.

Reference books:

1. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, Publishers

2. Power Electronics - by V.R.Murthy , 1st edition -2005, OXFORD University Press

3. Power Electronics-by P.C.Sen, Tata Mc Graw-Hill Publishing.

4. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradra, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.

EE 6051
POWER ELECTRONICS LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

LIST OF EXPERIMENTS:

1. Static characteristics of SCR
2. Static Characteristics of MOSFET & IGBT.
3. Gate triggering methods for SCR's (R, R-C, UJT)
4. Single phase fully controlled rectifier with R, R-L & R-L-E load (With or without feedback diode)
5. Characteristics of Jone's chopper.
6. Characteristics of Single – phase modified series inverter
7. Characteristics of Single - phase parallel inverter with R & R-L loads
8. Characteristics of Single - phase cycloconverter (Centre tapped or Bridge)
9. Study of single - phase full wave McMurray Bedford Inverter
10. Single phase Dual converter with R & RL loads (Circulating & Non-Circulating modes)
11. 3-Phase fully/half controlled rectifier with R & R-L, R-L-E loads.
12. Speed control of Universal motor by using half controlled 1-phase bridge converter/ 1-phase AC regulator.
13. Matlab simulation of Speed control of Universal motor by using 1-phase AC regulator
14. Matlab simulation of single phase fully controlled with R & R-L, R-L-E loads.
15. Matlab simulation of single phase step down cycloconverter (Centre tapped)
16. Matlab simulation 3-phase PWM inverter

Note: minimum 10 experiments are to be completed.

EE 6052
CONTROL SYSTEMS & MICROPROCESSORS LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Objectives: This laboratory course will give a thorough knowledge about the components of control systems and controllers and the basics of Micro processor and assembly language programming.

List of Experiments (Microprocessors Lab)

1. Write assembly language program to find the sum of the first 100 integers.
2. Write assembly language program to find the number of negative and positive elements in a given series of data.
3. Write assembly language program to find maximum and minimum number from a given series of data.
4. Write assembly language program to move the given array of data from one location to another location.
5. Write assembly language program to find square and square root of a given number using successive odd integers.
6. Write assembly language program to arrange given list in ascending and descending order using bubble sort.
7. Write assembly language program to convert a given binary to gray code and to covert decimal to seven segment using lookup table.
8. Interfacing of A/D converter.
9. Interfacing of D/A converter.
10. Interfacing of Stepper motor

List of Experiments (Control Systems Lab)

1. Time response of second order system (MATLAB also)
2. Characteristics of synchros.
3. Effect of feedback on D.C. motor.
4. Transfer function of D.C. motor.
5. Effect of P, PI, PID controller on a second order system.
6. Lag and Lead compensation – Magnitude and phase plot.
7. Transfer function of D.C. generator.
8. Temperature controller using PID.
9. Characteristics of Magnetic amplifier.
10. Characteristics of A.C. servo motor.
11. Stability studies using SIMULINK
12. Stability studies using Nyquist and Bode Plots using MATLAB
13. State Space Analysis using MATLAB

Note: A minimum of 5 (Five) experiments have to be completed from each lab (total of 10 experiments) to attain eligibility for Practical Examinations.

EE 6053
MINI PROJECT

Lecture	: -	**Internal Assessment**: 75*
Tutorial	: 1 hr/ week	**Final Examination**: -
Practical	: -	**Credits**: 1

Course Objective: The student is introduced to the concept of validating a simple idea through model preparation/ Software package or solving a simple Industrial/ Theoretical problem.

Learning Outcomes: student will be able to identify and solve theoretical or practical engineering problems of simple nature.

*25 Marks for continuous assessment and 50 marks for final presentation evaluated internally.

Distribution of Marks:

Internal Evaluation: 25

Attendance	:	5
Report	:	10
Seminar & Viva:		10

Semester end Evaluation: 50

Report	:	40
Seminar & Viva:		10

EE 7001
UTILIZATION OF ELECTRICAL POWER

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objective:
To enable the students to have a fair knowledge about Electric heating welding, illumination, traction and their uses in industry. To Understand the concept behind illumination and about battery maintenance, to select a particular motor for specific purpose and to have basic knowledge about traction systems.

Subject Learning Outcomes:
After completing this course, students will be able to:
1. Select the motor power ratings for the specific and respective different applications
2. Analyses and design the mechanics of train movements and their schedule speed and timings along with controlling the locomotive
3. Know how to utilize the electrical energy for production of heat and welding process
4. Designing of heat elements such as furnaces and ovens
5. Know the lighting calculations for different kinds of lamps

Unit–I

MOTOR POWER RATING AND SELECTION:

General considerations in selecting motor power ratings, Selection of motor capacity for continuous duty. Equivalent current, torque and power methods, Selection of capacity for short time and intermittent periodic duty. Heating and cooling of motors. Load equalization, fly wheel and its applications in load equalization.

Unit–II

ELECTRIC TRACTION:

Systems of electric traction - transmission of drive - mechanics of train movement, speed-time curves, effect of speed, acceleration and distance on schedule, Power and energy output from driving axles, specific energy output, series – parallel method of speed control shunt bridge transition, collectors, different types of electric braking, reverse current, rheostat and regenerative braking. Counter current braking and reversal of shunt motors.

Unit–III

ELECTRIC HEATING:

Elementary principles of heat transfer, Stefan's law, electric furnaces, resistance furnace, design of heating element, losses and efficiency, Construction and working of different types of induction furnaces, Dielectric heating, arc furnaces, control equipment.

WELDING:

Types of welding, resistance and arc welding, Characteristics of Carbon and metallic arc welding, comparison (Excluding electronic controls).

Unit–IV

ILLUMINATION:

Light production by excitation, Gas discharge lamps, Fluorescent lamps, Ultra violet lamps, Arc lamps, Filament lamps, Polar curves, Effect of voltage variation, Lighting calculations solid angle and square law methods of calculation, Factory lighting, flood lighting and street lighting, LED lighting.

Learning Resources:

A. Text Books:

1. Utilization Electric Power by Openshaw Taylor, MacMilllon publisher
2. Utilization of Electrical Power by J.B.Gupta, Kataria publisher

B.Reference Books:

1. Fundamentals of Electrical Drives by Gopal.K.Dubey,Narosa publishing house
2. Utilization of Electrical Energy by H.Partab

EE 7002
HIGH VOLTAGE ENGINEERING

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:
To develop knowledge on generation and measurement of high voltage DC, AC (power frequency and high frequency), impulse voltages and currents. To understand thoroughly various high voltage testing techniques of power apparatus and Insulation coordination in power systems. To understand structure of Gas Insulated Substations and various numerical methods for field calculations.

Learning Outcomes:
Upon completion of this course, the students shall be able to understand high voltage basics and its generation and measurements, application of high voltages for testing various power apparatus. The concepts of Field calculations, Insulation coordination and structure of Gas Insulated Substations.

Unit-I

GENERATION OF HIGH D.C AND A.C VOLTAGES:
Principle of Voltage Doubler circuit, Cockcroft-Walton cascade arrangement, and its Mathematical analysis; cascade connection of transformers, resonant transformers, Tesla coil.

GENERATION OF IMPULSE VOLTAGES:
Standard specifications, standard wave shapes for testing, properties of double exponential wave shapes, approximate estimate of wave shape control resistors, Multistage impulse generator, Energy of impulse generator.

GENERATION OF IMPULSE CURRENTS:
Standard specifications, analysis of impulse current generator.

Unit-II

MEASUREMENT OF HIGH VOLTAGES:
General concepts of High voltage measurements, voltage Dividers (Resistive, Inductive and Capacitive) for high voltage measurement. Storage Oscilloscope, peak voltmeter and Sphere gap. Use of fibre optics in H.V measurement.

Unit-III

HIGH VOLTAGE TESTING TECHNIQUES:
Testing of insulators, Bushings, isolators and CB's, testing of transformers, Fault detection using Wavelets-theoretical aspects.

INSULATION COORDINATION:
Principle of insulation coordination on high voltage and extra high voltage power systems.

Unit-IV

NUMERICAL METHODS FOR ELECTRICAL FIELD COMPUTATION:
Finite difference method, Finite element method, charges simulation methods, Boundary element methods.

GAS INSULATED SUBSTATIONS:
Advantages of Gas Insulated Substations, comparison of Gas Insulated substations and Air Insulated Substations, Design and Layout of Gas Insulated Substations, Description of Various components in GIS.

Text book:

1) Naidu M. S. and Kamraju V., High voltage Engg. TMH publications second ed.,1995

Reference book:

1) E. Kuffel, W. S. Zaengl and J. Kuffel., High Voltage Engineering Fundamentals Second Edition Elsevier Publication
2) Naidu M.S., Gas Insulated Substations, I.K International Publishing House Pvt. Ltd.2008

EE 7003
POWER SYSTEM ANALYSIS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
This course provides the basic concepts on load flows that enables the students to gain comprehensive knowledge on analysis of a power system thereby construct the mathematical model of a given power system, analyse the behavior of the power system under abnormal conditions and check whether the system is within stability limits.

Learning Outcomes:
1. Understand the representation and functional description of different equipment in power systems, p.u computation of different electrical quantities and application of these p.u quantities in analysing the power system.
2. Understand the main information obtain from load flow study which comprises the magnitudes and phase angles of load bus voltages, reactive power at generator buses, real and reactive power flow on transmission lines, other variables being specified with the help of iterative methods. Analyzing the power system under balanced fault conditions thereby calculate the settings of relay which controls the circuit breaker.
3. Understand the transformation of unbalanced system to balanced system using symmetrical components, application of these concepts in unbalanced fault analysis of power system.
4. Understand the dynamics of synchronous machine, factors affecting steady state and transient stability. Calculations of steady state and transient stability limits with the help of equal area criteria and step by step method.

Unit–I

REPRESENTATION OF POWER SYSTEMS:
Structure of power system-functional description of different equipments:
Modelling of power system components for system studies: synchronous generator, Transformer, transmission lines and representation of loads [Text Book-1]
One-line diagram of power system and its equivalent representation by impedance and reactance diagrams.
Per unit quantities-definition, advantages, selection of base for the quantity, change of base, per unit computation of voltage, current, complex power, impedance; per unit reactance / impedance diagram of a power system. [Text Book-2]

Unit–II

POWER SYSTEM IN STEADY STATE: [Text Book-2]
Network Model Formulation with admittance (Y_{bus}), load flow problem, static load flow equations using Y_{BUS}, load flow solution using Gauss, Gauss-Seidal and NR methods (Polar and Rectangular Coordinates)

SYMMETRICAL FAULT ANALYSIS: [Text Book-1]
Symmetrical short circuit on an unloaded synchronous generator- steady state, transient and sub transient models, representation of motors, calculation of symmetrical short circuit currents for simple systems, short circuit current computation through Thevenin's theorem, selection of circuit breakers.

Unit–III

SYMMETRICAL COMPONENTS & ANALYSIS OF UNBALANCED FAULTS: [Text Book-2]

Introduction, Symmetrical component transformation, Power in terms of symmetrical components, phase shift in star/Delta transformers, sequence impedances of transformers, transmission lines and synchronous machines; construction of sequence networks of a power system.

Unbalanced fault analysis & application of symmetrical components; shunt and series type faults- single line to ground fault, line–to-line fault, double- line – to – ground fault, open conductor faults.

Unit–IV

POWER SYSTEM STABILITY: [Text Book-2]

Introduction, Dynamics of Synchronous machine, Power angle equation, transient and steady state stability, development of the swing equation, swing curves, transient and steady state stability limits, application of equal area criterion to one machine infinite bus and two machine power system, critical clearing angle, critical clearing time, Step by step method. factors affecting steady state and transient stability, methods of improving stability

Learning resources:

A.Text Books:

1) Modern power system analysis by D.P.Kothari and I.J.Nagrath , TMG
2) Power system Analysis by J.J.Grainger & W.D.Stevenson. Jr, TMH,2007.

B.Reference Books:

1) Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press,2007
2) Electrical Power Systems by Ashfaq Hussain ,CBS Publishers & Distributors.

EE 7004
ADVANCED CONTROL SYSTEMS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

Control system design using state feedback, to study the behavior of non-linear systems for different types of nonlinearities and determining their stability. Introducing recent technologies for solving control system problems.

Learning Outcomes:

After completing this course, students will be able to:

1. Design control systems using state feedback
2. Analyse non linear control systems using describing function.
3. Determine the stability of non-linear systems using Lyapunov's method.
4. Design controllers using Fuzzy logic.

Unit-I

STATE FEEDBACK CONTROLLERS AND OBSERVERS:

Review of state space concepts, State feedback controller design through Pole Assignment – State observers: Full order and Reduced order.

Unit-II

NONLINEAR CONTROL SYSTEMS: DESCRIBING FUNCTION ANALYSIS:

Introduction - the frequency-amplitude dependence, jump resonance, subharmonic oscillations, self - excited oscillations or limit cycles, frequency entrainment; common physical nonlinearities - saturation, friction, backlash, hysteresis, dead zone, relay; Describing Functions of nonlinearities, Describing Function analysis of nonlinear control systems.

Unit III

LYAPUNOV'S STABILITY THEORY:

State space description of linear time - invariant continuous - time autonomous systems and the equilibrium state; Stability theorems in the sense of Lyapunov - stable, asymptotically stable, globally asymptotically stable; instability theorem; sign definite functions. Lyapunov functions and Lyapunov's theorems on stability and asympolic stability. Stability analysis of linear time - invariant continuous - time systems using Lyapunov functions- solution of the Lyapunov matrix equation $A^TP + PA = - Q$.

Unit- IV

FUZZY CONTROL:

Introduction – model – based control (Vs) rule - based control, premise (antecedent) and conclusion (consequent) rules; Fuzzy quantification of knowledge- what is Fuzzy logic? Fuzzy sets, Fuzzy operations, Fuzzy relations. Fuzzy inference- Mamdani Fuzzy rules, Takagi- Sugeno Fuzzy rules. Designing a Fuzzy logic controller - step-by-step procedure for designing a water heating system.

Learning resources:

TEXT BOOKS:

1. Control Systems Engineering by I.J.Nagrath & M.Gopal, New Age Int.(P), 4/E

REFERENCE BOOKS:

1. Modern Control engineering by K.Ogata, PHI, 2nd Edition
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications by Rajasekharan and Pai, PHI

EE 7005
INDUSTRIAL DRIVES

Lecture	: 3 hrs/ week	**Internal Assessment**:	30
Tutorial	: 1 hr/ week	**Final Examination**:	70
Practical	: -	**Credits**:	3

Objectives:

The course aims to develop understanding of dc machines, induction machines and various drives and includes the development of knowledge of energy conversion, operational parameters and characteristics.

Learning Outcomes:

After completing this course, students will be able to:

1. Understand the concepts of dynamics of electric drives.
2. Learn various energy conversion techniques for electric drives.
3. Learn the various control techniques for AC & DC motors.

Unit-I

REVIEW OF ELECTRIC DRIVES: [Text Book-I]

Electric Drives-Advantage of Electric Drives-selection of Motor power rating-Thermal model of motor for heating and cooling - Classes of duty cycle-Determination of motor rating - control of Electric drives- modes of operation - speed control and drive classifications - closed loop control of drives.

Unit-II

SOLID STATE CONTROL OF DC DRIVES: [Text Book-I]

DC Motor Drives:-DC motor and their performance-Braking - Transient analysis - Ward Leonard drives - Transformer and uncontrolled rectifier control - controlled rectifier fed DC drives - Chopper controlled DC drives - Time ratio control and current limit control - Single, two and four quadrant operations - Effect of ripples on the DC motor performance.

Unit-III

SOLID STATE CONTROL OF INDUCTION MOTORS: [Text Book-I]

Induction Motor Drives-Stator control-Stator voltage and frequency control - AC chopper, Inverter and cyclo- -converter fed induction motor drives - Rotor control - Rotor resistance control and slip power recovery scheme - static control of rotor resistance using DC chopper.

Unit-IV

SOLID STATE CONTROL OF SYNCHRONOUS MOTORS: [Text Book-I]

Synchronous Motor Drives-Speed control of three phase synchronous motors- Voltage and current source fed synchronous motor - cycloconverter fed synchronous motors- Stepper motors-BLDC motor

Learning resources:

TEXT BOOKS

1. Dubey.G.K., Fundamental of Electrical Drives, Narosa publishing House 1995
2. Pillai.S.K., A first course on Electrical Drives, New Age International (P) Ltd 1984

REFERENCE BOOKS

1. Vedam Subramanyan, Thyristor control of Electrical Drives, Tata Mc Graw Hill Publications, 1996
2. Bimal K.Bose Modern Power Electronics and AC Drives, Prentice Hall of India, 2005

EE 7006/1
DATABASE MANAGEMENT SYSTEMS
(ELECTIVE-I)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
To provide a general introduction to relational model , learn about ER diagrams, learn about Query Processing and Transaction Processing.

Learning outcomes:
Understanding the relational Database design and query languages.

UNIT I

1. Databases and Database users.
2. Database systems concepts and Architecture.
3. Data modeling using the Entity-Relationship model.

UNIT II

4. The Relational Data Model, Relational constraints, and the Relational Algebra.
5. SQL-The Relational Database Standard.
6. ER and EER – to – Relational mappings, and other Relational languages.

UNIT III

7. Functional Dependencies and Normalizations for Relational Databases.
8. Relational Database Design Algorithms and Further Dependencies.
9. Database system Architectures and the system catalog.

UNIT IV

10. Transactions Processing Concepts.
11. Concurrency Control Techniques.

Learning resources:

TEXTBOOK

1. Elmasri and Navathe, 'Fundamentals of Database Systems', 3rd edition, Addison Wesley, Pearson Education,Inc.2000.

REFERENCE BOOKS

1. Bipin C.Desai, 'An Introduction to Database Systems', West Publishing Company,2000.
2. CJ Date, 'An Introduction to Database Systems', 6th Edition, Addison Wesley Longman Inc

EE 7006/2
HVDC TRANSMISSION
(ELECTIVE-II)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters and MTDC systems

Learning Outcomes:

1. Understand the basics of HVDC Transmission systems, Learning about advantages and disadvantages of DC with AC Transmission. To have Knowledge about the Modern trends in HVDC Transmission.
2. Understand the analysis of HVDC converters and characteristics of 6 and 12 pulse converters with and without overlapping.
3. Understand the converter control characteristics, Various controlling methods of converters such as firing angle, current and extinction angle control. Learn the converter faults and their protection schemes.
4. Understand generation of harmonics, its adverse effects and also the design of filters for harmonic elimination. Learn about Multi terminal DC systems.

UNIT – I
BASIC CONCEPTS:
Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – II
ANALYSIS OF HVDC CONVERTERS:
Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance.

UNIT – III
CONVERTER & HVDC SYSTEM CONTROL:
Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.
CONVERTER FAULT & PROTECTION:
Converter faults – protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers

UNIT – IV

HARMONICS:

Generation of Harmonics –Characteristics harmonics, calculation of AC Harmonics, Non-Characteristic harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics . Types of AC filters,Design of Single tuned filters –Design of High pass filters.

MULTI TERMINAL SYSTEMS:

Introduction, Applications of MTDC systems, Types of MTDC systems –Series, Parallel, Comparison of series and parallel.

Learning Resources:

TEXT BOOKS:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited and Publishers.(New Edition)
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.

REFERENCE BOOKS:

1. HVDC Transmission – J.Arrillaga.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications.

EE 7006/3
OPTIMIZATION TECHNIQUES
(ELECTIVE-III)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

The study of Optimization Techniques emphasizes Mathematical Modeling, problem solving and the effect of marginal change in parameters on the solution of the problem.

Learning outcomes:

After Studying this Course the student can write problems in real life situations which are usually optimization problems, simulation problems involving several flexible parameters and apply scientific methods to problems arising from operations involving integrated systems of men, machines and materials.

Unit–I

Linear Programming:

Introduction and formulation of models, Convexity, simplex method, Bid-method, two phase method, degeneracy, non-existent and unbounded solutions, duality in L.P., dual simplex method, sensitivity analysis, revised simplex method, transportation and assignment problems.

Unit–II

Non-linear Programming:

Classical optimization methods, equality and inequality constraints, Lagrange multipliers and Kuhn-Tucker conditions, quadratic forms, quadratic programming and Beales method.

Unit–III

Search Methods:

One dimensional optimization, sequential search, Fibonacci search, multi dimensional search method, Univariate search, gradient methods, steepest descent / ascent methods, conjugate gradient method, Fletcher – Reeves method, penalty function approach.

Unit–IV

Dynamic Programming:

Principle of optimality recursive relation, solution of linear programming problem, simple examples

Learning Resources:

TEXT BOOKS:

1. Engineering Optimizaion: Theory and Practice by S.S.Rao, 3rd Ed., New Age International, 1998
2. Optimization Methods in Operations Research and Systems Analysis by K.V.Mittal and C. Mohan, 3rd Ed, New Age International, 1996.

REFERENCE BOOKS:

1. Non-linear Programming by P.L. Mangassarian
2. Operations Research by S.D.Sharma
3. Operations Research: An introduction by H.A.Taha, 6th Edition, PHI
4. Linear Programming by G.Hadley

EE 7006/4
SOFT COMPUTING
(ELECTIVE-IV)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:

This course enables students to understand the concepts of artificial neural networks, fuzzy systems and their applications. This course also introduces students to genetic algorithms and artificial intelligent techniques.

Learning outcomes:

After completing this course, students will be able to:

- Learn the concepts of fuzzy systems and neuro-fuzzy modeling.
- Understand the concepts of artificial neural networks.
- Understand the basic concepts of Genetic algorithms.

UNIT–I

Basic tools of soft Computing-Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non-linear Error surface and optimization.

UNIT–II

Fuzzy Logic Systems: Basics of fuzzy logic theory, Crisp and fuzzy sets. Basic set operations. Fuzzy relations, Composition of Fuzzy relations, Fuzzy inference, Zadeh's compositional rule of inference. Defuzzificaiton. Fuzzy logic control: Mamdani and Takagi and Sugeno architectures. Applications to pattern recognition and control.

UNIT–III

Neural networks: Single layer networks, Perception. Activation functions. Adaline: its training and capabilities, weights learning, Multilayer perceptrons: error back propagation, generalized delta rule. Radial basis function networks and least square training algorithm, Kohenen self-organizing map and learning vector quantization networks. Recurrent neural networks, Simulated annealing neural networks. Adaptive neuro-fuzzy information; systems (ANFIS), Applications to control and pattern recognition.

UNIT–IV

Evolutionary Computing: Genetic algorithms: Basic concepts, encoding, fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic programming concepts and applications.

Text Book:

1. V.Keeman, "Learning and Soft computing", Pearson Education, India.
2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall 1998.

References:

. 1. S.N.Sivanandam & S.N.Deepa, "Principles of Soft computing", Wiley – India Edition, 2007.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis and Applications by Rajasekharan and Pai, PHI

EE 7006/5
INDUSTRY OPEN SLOT
(ELECTIVE-V)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

EE 7051
C++ & DSP LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course objectives:
To provide fundamental knowledge and skills to implement C++ programming to the electrical engineering problems, and to evaluate DFT, IDFT and design various digital filters.

Learning Outcomes:
After completing this course, students will be able to:

- Implements fundamental constructs of OOP-classes, objects and inline functions to realize the electrical engineering problems.
- Evaluate DFT, IDFT using various algorithms and design various filters

C++ laboratory

1. Write a menu driven program to find equivalent resistance of any number of resistors in (i) series and (ii) parallel.
2. Write a program that finds the equivalent resistance of a series-parallel circuit of any arbitrary configuration.
3. Write a program to calculate the mean and standard deviation of a series of numbers.
4. Write a menu driven structured program using Ohm's law to calculate
   a. voltage when current and resistance are given
   b. current when voltage and resistance are given
   c. resistance when current and voltage are given
5. Develop a program to generate a Fibonacci sequence of all numbers up to some position n by recursion and iteration methods. Comment on efficiency of recursion and iteration methods.
6. Develop a menu driven structured program for Bank showing balance, deposits and withdrawals.
7. Write a program to sequentially search an unsorted array of integers
8. Write a program to search a sorted array of integers using binary search.
9. Write a program to calculate the mesh currents and node voltages using Crammer's rule for a given electrical network that results in two simultaneous equations.
10. Write a program to calculate the mesh currents of given three-loop Wheatstone bridge circuit that results in three simultaneous equations.
11. Develop a multifile program using classes to find surface area, volume, perimeter of three cuboid objects.
12. Write a program using classes with a constructor Resistor (float Resistivity, float Length, float Area) to find resistances of three resistors
13. Develop a program using classes for ADT Stack.
14. Develop a program using classes for ADT Queue.
15. Develop a program using classes for ADT Linked List.

Note: minimum 5 experiments are to be completed from above experiments.

DSP Lab

LIST OF EXPERIMENTS

1. State and verify “linear convolution” using C program
2. State and verify “Circular convolution” using C program
3. Evaluation of DFT of a 16 sample sequence using DIT algorithm.
4. Evaluation of IDFT of a 16 sample sequence using DIT algorithm
5. Evaluation of DFT of a 16 sample sequence using DIF algorithm
6. Evaluation of IDFT of a 16 sample sequence using DIF algorithm
7. Design of FIR filter using windowing methods
8. Design of digital Butterworth filter using bilinear transformation
9. Design of digital Chebyshev filter using bilinear transformation.
10. Design of digital Butterworth filter using impulse Invariance Transformation method
11. Design of digital Chebyshev filter using Impulse Invariance Transformation method.
12. Design of digital filters using frequency transformation method
13. Direct realization of IIR filters
14. Cascade realization of IIR filters
15. Parallel realization of IIR filters.

Note: minimum 5 experiments are to be completed from above experiments.

Note: A minimum of 10 (Ten) experiments have to be completed from both labs to attain eligibility for Practical Examinations.

EE 7052
POWER SYSTEMS LABORATORY

Lecture	: -	**Internal Assessment**:	25
Tutorial	: -	**Final Examination**:	50
Practical	: 3 hrs/ week	**Credits**:	2

Course objectives:
This course will provide students essential knowledge required in power systems for its analysis and protection. This course also provides the students hands on experience in high voltage testing of various insulators and cables.

Learning outcomes:
After the successful completion of the course, the student will be able to:

- Analyze the performance of transmission lines and relays
- Calculate the steady-state power flow in a power system.
- Analyze different types of short-circuit faults which occur in power systems
- Analyze the performance of insulators and cables by High voltage testing.

LIST OF EXPERIMENTS:

1. Determination of ABCD parameters using Transmission line model
2. Regulation and efficiency of transmission line including Ferranti effect
3. Characteristics of over current relay & Earth fault relay
4. Characteristics of over voltage & under voltage relay
5. Characteristics of differential relay
6. Characteristics of definite time reverse power relay
7. Characteristics of negative sequence relay
8. Sequence impedances of transformer
9. Sequence impedances of alternator
10. Single line to ground Fault study of simple power system.
11. Determination of sub-transient, transient, steady-state reactance of an alternator
12. Reactive power compensation using tap changing transformer.
13. Short circuit analysis using PC
14. Develop a program for Y_{bus} by inspection
15. Develop a program for load flow analysis by Gauss and Gauss - Seidel iterative methods.
16. High voltage testing of Insulators
17. High voltage testing of Cables
18. Study of corona phenomena

Note: A minimum of 10 (Ten) experiments have to be completed to attain eligibility for Practical Examinations.

EE 7053
TERM PAPER

Lecture	: -	**Internal Assessment**:	75*
Tutorial	: 1 hr/ week	**Final Examination**:	-
Practical	: -	**Credits**:	1

DESCRIPTION
The Term Paper may be a precursor to the project work to be done in the VIII semester of the final year B.Tech, EEE program. This may be a team work.

PURPOSE
This helps to supplement the final year project work of the B.Tech students. It helps to identify their research area/topic and complete the groundwork and preliminary research required for it comfortably. It trains the students to make use of research tools and material available both in print and digital formats.

PROCEDURE
The topic of Term Paper is chosen from the B.Tech EEE curriculum. The students are then required to collect literature and support information from standard reference books, journals, and magazines both printed and online. Each student should refer to a minimum of 5 reference sources outside their prescribed textbooks. The students also present their Term Paper with the help of Power Point slides/ OHP.

The Term Paper contains

- The Aim and Object of the study
- The need for Rationale behind the study
- Identify the work already done in the field
- Hypothesis and Discussion
- Conclusion
- Appendix with support data (Illustrations, Tables, Graphs, etc.)

Last date of submitting the Term Paper: One week before commencement of 2nd Mid Term exams.

Date of Seminar: During the Lab Internal Examinations.

*25 Marks for continuous assessment and 50 marks for final presentation evaluated internally.

Distribution of Marks:

Internal Evaluation: 25

Attendance	:	5
Report	:	10
Seminar & Viva:		10

Semester end Evaluation: 50

Report	:	40
Seminar & Viva:		10

EE 8001
POWER SYSTEM OPERATION & CONTROL

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
The main course goal is to provide with an overview of the engineering and economic matters involved in designing, operating and controlling the power generation and transmission of a large scale, inter connected power system and familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

Learning outcomes:
After completing this course, students will be able to:

- Minimize fuel cost for economic operation of power systems
- Understand the importance of power quality
- Model prime movers, generators and loads for LFC
- Learn the concepts to keep the frequency constant using LFC
- Model amplifier, exciter, generators and sensors for AVR
- Understand the importance of FACTS devices and FACTS concepts
- Explain the functional content of SCADA

Unit–I
Economic operation of power systems: [Text Book - 1]
Economic dispatch in thermal power station: Heat rate curves, cost curves, incremental fuel and production costs, economic distribution of load between units without consideration to line losses; transmission line losses as a function of plant generation, calculation of loss coefficients, optimum generation allocation between thermal plants; unit commitment (introductory treatment only)

Unit–II
Quality of power: [Text Book - 2]
Importance of keeping voltage and frequency constant in a power system
The two main control loops- (P-δ) and (Q – V) loops:
Load frequency control (LFC) single area case, the P-δ loop: Schematic of load frequency and AVR of a synchronous generator, mathematical modeling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation, LFC block diagram of an isolated power system , steady state analysis, dynamic response. The automatic generation control (AGC) scheme – AGC in a single area system, block diagram representation of AGC for an isolated power system

Unit–III [Text Book - 2]
Reactive power control in synchronous generators: The role of excitation system- exciter, generator and sensor models , simplified AVR block diagram, steady state response for a step change in terminal voltage.

Reactive power compensation of loads: Shunt compensating devices [Ref Book – 1]
Transmission line compensation: Series compensation, shunt compensation, static VAR compensators – thyristor controlled reactors (TCR), thyristor switched capacitors (TSC), combined TCR and TSC, schematic of all three types ; Basic FACTS devices
Voltage control of distribution systems: Tap changing, booster transformers, synchronous phase modifiers and static capacitors.

Unit–IV
Power System Control centers: [Ref Book - 2]
Aim of control centres, Funtions of Control centres – Planning, Monitoring & Data acquisition and System control. Setup, locations, central & civil facilities. Facilities in control room. Communication-PLCC. Emergency control
Distribution Automation: Flow diagram for man machine power system interface. Schematic diagram of Remote Terminal Unit. Block diagram of smart and intelligent transmitter, SCADA system

Text Books:
1) Power system analysis by John J.Grainer and WD Stevenson Jr.,TMH 2007
2) Power system analysis by H.Saadat , Tata McGraw Hill, 2003
3) Modern power system analysis by D.P.Kothari & I.J.Nagrath McGraw Hill

Reference Books:
1) Power system operation and control by S.Sivanagaraju & G. Sreenivasan, Pearson 2010
2) Power System Analysis operation and control by Abhijit Chakrabarti & Sunita Halder, PHI
3) Generation Distribution and utilization of Electrical Energy by CL Wadhwa, New Age Int. publications, revised 2/E

EE 8002/1

ENERGY CONSERVATION & AUDIT

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objective:
The main course goal is to provide acquaintance with analytical principles such as Energy audit, Co-generation, Industrial Engineering technique of Energy saving and to provide familiarity with plant level energy audit calculations.

Learning outcomes:
After completing the course, the students will be able to:

1. Suggest methods of energy conservation for different load conditions.
2. Apply Tools for energy audit and recommend measures for energy conservation.
3. Select appropriate tariff system and methods for reducing electricity consumption and energy saving.

Unit-I
System approach and End use approach to efficient use of Electricity; Electricity tariff types; Energy auditing; Types and objectives - audit instruments - ECO assessment and Economic methods - specific energy analysis - Minimum energy paths-consumption models - Energy auditing of a typical industrial unit - case study.

Unit- II
Electric motors- Energy efficient controls and starting efficiency-Motor Efficiency and Load Analysis-Energy efficient / high efficient Motors-Case study; Load Matching and selection of motors. Variable speed drives; Pumps and Fans-Efficient Control strategies-optimal selection and sizing – Optimal operation and storage; Case study

Unit-III
Transformer Loading/Efficiency analysis, feeder/cable loss evaluation, case study.
Reactive power management-Capacitor Sizing-Degree of Compensation-Capacitor losses-Location-placement-Maintenance, case study; Peak Demand controls-Methodologies-Types of Industrial loads-Optimal Load scheduling-case study; Lighting-Energy efficient light sources-Energy conservation in Lighting Schemes-Electronic ballast-Power quality issues-Luminaries, case study;

Unit-IV
Cogeneration-Types and Schemes-Optimal operation of cogeneration plants-case study;
Electric loads of Air conditioning & Refrigeration-Energy conservation measures-Cold storage, Types –Optimal operation –case study; Electric water heating- Geysers-Solar Water Heaters, Power Consumption in Compressors, Energy conservation measures; Electrolytic Process; Computer Controls- softwares -EMS.

Text Books:

1. Industrial Energy Management: Principles and Applications by Giovanni and Petrecca, The Kluwer international series-207 (1999)
2. Economy Loading of Power plant and Electric systems by M.J. Steinburg and T.H. Smith, John Willey and sons
3. Guide to Electric Load Management by Anthony J.Pansini, Kenneth D.Smalling, Pennwell pub (1988)

Reference Books:

1. Energy-Efficient Electric Motors and their applications by Howard E.Jordan, Plenum pub corp; 2nd ed. (1994)
2. Energy Management Hand book by Turner, Wayne C, Lilburn, The Fairmont press, 2001
3. Handbook of Energy Audits by Albert Thumann, Fairmont Pr; 5th edition (1998)
4. Recommended practice for Energy Conservation and cost effective planning in Industrial facilities by IEEE Bronze book, IEEE Inc, USA
5. Electric Energy Utilization and Conservation by Tripathy S.C , TMH
6. Hand book on Energy Audit and Management by Amit kumar Tyagi, published by TERI (Tata energy research Institute)

EE 8002/2
NON-CONVENTIONAL ENERGY SOURCES

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course objective:

To familiarize the students with the different types of non conventional energy resources like solar, wind, biomass and ocean energy sources.

Learning Outcomes:

After completing the course, the students will be able to understand in detail the use of and production of electrical energy from - solar energy, wind energy, biomass energy, ocean and tidal energy.

Unit-I

CONVENTIONAL SOURCES OF ENERGY

Energy - Conventional, renewables, non-conventional and alternate sources of energy - Energy supply system in India. Coal and Coal technologies - Petroleum and natural gas - nuclear fuels and power plants - Hydro sources and power plants - Energy strategies - energy conservation - energy audit - cost of energy.

SOLAR ENERGY

Application of Solar Energy - Various solar energy systems and their applications, radiations, solar spectralatitude and longitude, Declination angle, solar window, cosine law, seasonal variations, daily variation, hour angle, calculation of angle of incidence, angstroms equation and constants, solar radiation data, daily global radiation calculations, design of solar panels.

Unit-II

WIND ENERGY

Wind energy - energy chains, application - historical background, merits and limitations, nature of wind, planetary and local day / night winds, wind energy quantum, variables and units used in calculations, wind power density P_w, Power calculations, power in wind, power by turbine, efficiency, kinetic energy, incoming velocity V_i, exit velocity V_e, Power, torque thrust calculations, velocity at different heights, site selection, Favourable wind speed range, wind energy wind velocity duration, energy pattern factor.

Unit-III

BIOMASS ENERGY

Biomass energy resources : Photosynthesis and origin of biomass energy, biomass energy resources, cultivated biomass resources, waste to biomass resources, Terms and definitions, Incineration, wood and wood waste, Harvesting super trees and energy forests, phyrolysis, Thermo chemical biomass conversion to energy, gasification, Anaerobic digestion, Fermentation, Gaseous fuel from biomass.

Unit-IV

OCEAN & TIDAL ENERGY

Ocean and Tidal energy conversion, Energy sources in ocean - Ocean tidal, wave and thermal energy, Ocean saline gradient concept, ocean currents, ocean chemical energy, ocean energy conversion routes, electrical and non electrical routes, Bipolar, mono polar, HVDC cable transmission , Merits and demerits of ocean energy technologies, limitation, preconditions for commercial installation. Tides - spring tide, neap tide, daily and monthly variation, Tidal range, Tidal Power, Types of tidal power plants, single basin & double basin schemes, main requirements in tidal power plants, energy storage, prospects of tidal power, economic factors.

FUEL CELLS: Design and principle of operation of Fuel Cells.

Learning resources:

A.TEXT BOOKS:

1. Rao. S. & Parulekar, Energy Technology – Non conventional, renewable and conventional, Khanna Publishers, Third edition, 1999.
2. Pai & Ramaprasad, Power Generation through renewal sources, Tata McGraw Hill – 1991.

B.REFERENCE BOOKS:

1. Rai, G.D., Non conventional energy sources, Khanna Publishers ,4th Edition 1996.
2. Bansal NK, Kleeman and Meliss M, Renewable energy sources and conversion Techniques, Tata Mc Graw Hill, 1990.

EE 8002/3
FACTS CONTROLLERS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Course Objective:

- To understand the need for FACTS
- To learn shunt and series compensation techniques
- To learn about controlled voltage and Phase angle regulator
- To learn the concept of unified power flow controller and IPFC

Learning outcomes:

The students will be able to demonstrate knowledge and understanding of:

- Need of FACTS controllers in Power System network
- Fundamental concepts of FACTS controllers
- Classification of FACTS controllers
- Factors that influence power system operation and control
- Methods to improve and maintain stability
- Static Shunt and Series compensating methodologies
- The concept of functional control schemes of FACTS devices
- Basic structure of different FACTS controllers

Unit-I

FACTS CONCEPT AND GENERAL SYSTEM CONSIDERATIONS:
Electrical Transmission Network - Necessity - Power Flow in AC System - relative importance of controllable parameters - Basic types of FACTS Controllers -opportunities for FACTS - possible benefits for FACTS.

VOLTAGE SOURCE CONVERTERS : Basic concept of Voltage source converter – Three phase full-wave bridge converter – operation – Fundamental and Harmonics, Transformer Connections for 6 and 12 pulse operation – PWM Converter - Harmonic elimination and Voltage control

Unit-II

STATIC SHUNT COMPENSATORS:
Objectives of shunt compensation - Methods of controllable VAR generation –configuration-operating characteristics of TCR, TSR and TSC - functional control schemes. STATCOM – operating principle – control schemes, Comparison between STATCOM and SVC

Unit-III

STATIC SERIES COMPENSATION:
Objectives of Series Compensation - GCSC, TSSC, TCSC and SSSC - Operation and Control, External System Control for series Compensators, SSR and its damping-Static Voltage and Phase Angle Regulators, TCVR and TCPAR - Operation and Control.

Unit-IV

UPFC AND IPFC:

The unified Power Flow Controller, Operation, Comparison with other FACTS devices, control of P and Q, Dynamic Performance, Special Purpose FACTS controllers, Interline Power flow Controller, Operation and Control.

Learning Resourses:

A. TEXT BOOKS:

1.Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, 2000 by N.G.Hingorani & L.Gyugyi

B. REFERENCE BOOKS:

1. Reactive Power Control in Electric Systems by T.J.E.Miller , John Wiley & sons
2. FACTS Controllers in power transmission and Distribution, K.R.Padiyar, New Age Int. Publisher, 2007

EE 8002/4
COMPUTER NETWORKS

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
To understand the concepts of data communications, to study the functions of different layers, to make the students to get familiarized with different protocols and network components.

Learning outcomes:
Understanding the various layers in Computer Networking and its Protocol design.

UNIT I

INTRODUCTION:
Uses of computer networks, Network hardware, Network software, Reference models – OSI – TCP/IP

PHYSICAL LAYER:
Guided transmission media, Wireless Communication, Local Loop, Communication Satellites, Trunks and Multiplexing, Switching.

UNIT II

DATA LINK LAYER:
Data link Layer design issues, Error Correction and Detection, Elementary data link Protocols, Sliding window protocols

MEDIUM ACCESS CONTROL SUB LAYER:
Channel Allocation Problem, Multiple Access protocols, Ethernet - Cabling- Manchester coding - MAC Sub Layer Protocol-Binary Exponential Back off Algorithm, Wireless LANs, Broad Band Wireless, Bluetooth-Architecture-Applications-Protocol stack, Data Link Layer Switching – Bridges from 802.x to 802.y – Spanning Tree Bridge – Remote Bridge.

UNIT III

NETWORK LAYER:
Network Layer Design Issues, Routing Algorithms – Shortest Path Routing – Flooding – Distance Vector Routing – Link State Routing – Hierarchical Routing – Broadcast Routing – Multicast Routing – Routing for Mobile Hosts, Congestion Control Algorithms - Congestion Prevention Policies, Quality Of Service - Techniques for achieving good Quality Of Service – Over Provisioning – Buffering – traffic shaping – Leaky Bucket Algorithm – Token Bucket Algorithm, Internetworking, Network Layer in the Internet – IP protocol – IP address - Subnets – CIDR, Internet Control Protocols.

TRANSPORT LAYER:
Transport Service, Elements of Transport Protocol – Addressing, Internet Transport Protocols – UDP – TCP protocol – TCP segment header – TCP connection establishment- TCP connection release.

UNIT IV

APPLICATION LAYER:

DNS, Electronic mail, WWW – Architectural Overview

NETWORK SECURITY:

Cryptography – Introduction – Substitution Ciphers –Transposition Ciphers – One-Time Pads – Two Fundamental Cryptographic Principles, Symmetric Key Algorithms – AES, DES, Public Key Algorithms – RSA

TEXT BOOKS

1.A.S. Tanenbaum, Computer Networks Fourth edition, PHI Education, 2003

EE 8003/1
COMPUTER AIDED POWER SYSTEM ANALYSIS
(ELECTIVE-I)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
The performance, safety, efficiency, reliability and economics of a power delivery system. It emphasizes the use and interpretation of computational data to assess system operating limits, load level increases, equipment failure and mitigating procedures through computer-aided analysis to maximize cost-effectiveness.

Learning Outcomes:

1. To understand the formation of different network matrices using singular and nonsingular transformation
2. To understand the formation of algorithms to compute network matrices that are used in calculations for short circuit faults
3. To understand the use of numerical methods for power flow analysis optimal power flow analysis short circuit analysis and stability analysis
4. To understand the modeling of synchronous machine, excitation system and governor control systems.

Unit–I
INCIDENCE & NETWORK MATRICES: [Text Book-1]
Element-node incidence matrix, reduced incidence matrix or bus incidence matrix, basic loop incidence matrix, augmented loop incidence matrix, basic cut-set incidence matrix, augmented cut-set incidence matrix, branch path incidence matrix, concept of primitive network, primitive impedance and admittance matrices with and without mutual coupling, network performance equations, formation of network matrices using singular & non-singular transformation

Unit–II
ALGORITHM FOR FORMATION OF NETWORK MATRICES: [Text Book-1]
Formation of bus admittance and bus impedance matrices and respective algorithms, modifications of bus impedance and admittance matrices for changes in the networks with and without mutual coupling, representation of three phase network elements for balanced and unbalanced systems,
SHORT CIRCUIT STUDIES: [Text Book-1]
Short circuit calculations for symmetrical and unsymmetrical faults using bus impedance matrix.

Unit–III
LOAD FLOW STUDIES: [Text Book-1]
Introduction, non-linear equations, solution techniques using Gauss iterative, Gauss – Seidal , Newton Raphson (rectangular and polar) methods, Fast decoupled Load flow using bus admittance matrix, acceleration of convergence, development of flow charts for load flow problems, comparison of different load flow methods.

Unit–IV

TRANSIENT STABILITY STUDIES: [Text Book-1] [Ref. Book-2]

Introduction - types of stability – swing equation, representing synchronous machine by constant voltage behind transient reactance (d- axis) Representation of loads, and network by steady state equations; Solution techniques- Modified Eulers method, Runga-Kutta method alternating solution approach for transient stability solving algebraic equations and differential equations alternately; Flow chart for digital simulation of transient stability problem. Representation of Exciter and governor control systems

Learning resources:

A.Text Books:

1. Computer methods in Power System Analysis by Stagg, G.W. & El-Abiad
2. Computer Techniques in Power System Analysis by M.A. Pai , TMH

B.Reference Books:

1. Modern power system analysis by Nagrath & Kothari
2. Advanced Power System Analysis and Dynamics by L.P.Singh

EE 8003/2
ELECTRICAL MACHINE DESIGN
(ELECTIVE-II)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
To develop knowledge on Principles of design of static and rotating machines. Also students must able to understand the design fundamental concepts, design main dimensions & cooling systems of transformers and main dimensions of rotating machine.

Learning Outcomes:
After completion of the course the student will acquire knowledge in basic concepts of machine design including the calculations of mmf, no load current of transformers, design of cooling tubes in a transformer, output equations of both static and rotating machines, design of main dimensions of machines etc. They also understand specific electric & magnetic loadings. They will also understand the principles of computerized design of machines limited to above background;

UNIT I
BASIC CONSIDERATIONS: [Text book 1]
Basic concept of design, limitation in design, standardization, modern trends in design and Manufacturing techniques, Classification of insulating materials. Modes of heat dissipation & temperature rise time curves. Methods of cooling ventilation (induced & forced , radial & axial), direct cooling & quantity of cooling medium. Calculation of total mmf and magnetizing current . Specific permeance and leakage reactance.

UNIT II
TRANSFORMER DESIGN: [Text book 1]
Output equation, design of core, yoke, and overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs.

UNIT III
DESIGN OF ROTATING MACHINES: [Text book 1]
Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size. Core and armature design of dc and 3-phase ac machines.

UNIT IV
COMPUTER AIDED DESIGN: [Text book 2]
Principles of computer aided design, flow chart for computer aided design, advantages and limitations.

TEXT BOOKS:
1. A Course in Electrical machine Design by A.K.Sawhney
2. Computer aided design of electrical equipment by M.Ramamoothy

REFERENCE:
1. Design of Electrical Machines K G Upadhyay

EE 8003/3
ELECTRICAL DISTRIBUTION SYSTEMS
(ELECTIVE-III)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
This course gives the basic fundamentals of the distribution systems planning and automation. It enhances the practical knowledge about electrical distribution systems for the student . This subject also provides the knowledge about the transmission of power from the generating stations to distribution substation. Apart from this, it also deals the voltage control.

Learning Outcomes:

1. Understand the power system planning and automation.
2. Understand the different types of distribution transformers.
3. Understand the transmission from the generating stations to sub stations and different substations bus schemes.
4. Understanding primary distribution and secondary distribution
5. learning protection of the distribution systems and its voltage control.

Unit–I

DISTRIBUTION SYSTEMS PLANNING AND AUTOMATION:
Introduction ,Distribution system Planning ,Factors affecting system planning, substation site selection .Present distribution planning techniques .Distribution system planning in the future .Future nature of distribution planning ,The central role of the computer in distribution planning .Distribution system automation, automation and control functions.

LOAD CHARACTERISTICS:
Characteristics, Definitions, the Relationship between the load and loss factors. load growth, Rate structure.

Unit–II

DISTRIBUTION TRANSFORMERS:
Different Types of distribution transformers , Regulation and Efficiency.

DEEGN OF SUB TRANSMISSION LINES AND DISTRIBUTION SUBSTATIONS:
Introduction, sub-transmission systems, distribution substation, Sub-station bus schemes, description and comparison of switching schemes, sub-station location, rating of a distribution substations.

Unit–III

DESIGN CONSIDERATIONS ON PRIMARY SYSTEMS:
Introduction, types of feeders: Radial type, loop type primary feeders, primary network, primary feeder voltage levels, primary feeder loading ,Radial feeders with uniformly distributed load and non-uniformly distributed loads

DESIGN CONSIDERATIONS OF SECONDARY SYSTEMS:
Introduction, secondary voltage levels, Secondary banking, secondary networks: rid network, spot network, secondary mains.

DISTRIBUTION SYSTEM PROTECTION:
Basic definitions, over current protection devices-fuses, automatic circuit reclosers, automatic line sectionalizers, automatic circuit breakers. Objectives of distribution system protection, co-ordination of protective devices- Fuse to Fuse co-ordination,
Recloser to fuse coordination, Fuse to circuit breaker co-ordination, Reclosure to circuit breaker co-ordination

Unit-IV

VOLTAGE DROP AND POWER LOSS CALCULATIONS:
Three phase primary lines, non 3 phase primary lines, 4 wire multi grounded primary lines, copper loss, Distribution feeder costs.

APPLICATIONS OF CAPACITORS TO DISTRIBUTION SYSTEMS:
Effect of series and shunt capacitors, Power factor correction, economic justification for capacitors, , Procedure to determine the best capacitor location.

DISTRIBUTION SYSTEM VOLTAGE REGULATION:
Basic definitions, Quality of service, voltage control, line drop compensation

Learning Resources:

A. Text Books:

1. Electric Power Distribution system Engg. by Turan Gonen, MGH

Reference Book:

1. Electric Power Distribution by A.S.Pabla, TMH, 4th Ed., 1997

EE 8003/4
COMPUTER ORGANIZATION
(ELECTIVE-IV)

Lecture	: 4 hrs/ week	**Internal Assessment**:	30
Tutorial	: -	**Final Examination**:	70
Practical	: -	**Credits**:	4

Objectives:
Gives a knowledge of various architectures, CPU, Control unit, I/O Processing, Memory and its types, Design of the above components

Learning out comes:
The purpose of this course is to give a strong foundation of the computer organization and its internal architecture.

UNIT I

REGISTER TRANSFER AND MICRO-OPERATIONS:
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic Logic Shift Unit.

BASIC COMPUTER ORGANISATION AND DESIGN:
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output and Interrupt, Design of Basic Computer, Design of Accumulator logic.

UNIT II

MICRO PROGRAMMED CONTROL:
Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.

CENTRAL PROCESSING UNIT:
General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

UNIT III

COMPUTER ARITHMETIC:
Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-point Arithmetic Operations.

MEMORY ORGANISATION:
Memory Devices, Semiconductor Memories, Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

UNIT IV

INPUT-OUTPUT ORGANISATION:
Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor, Serial Communication.

TEXT BOOK

1. M.Morris Mano, Computer System Architecture, 3rd Edition, PHI, 2003.

REFERENCE BOOK

1. Rajaraman : Computer Organisation & Architecture- PHI – 1ST Edition-2007
2. John P Hayes, 'Computer Architecture and Organization', 2nd edition
3. V.Carl Hamacher et.al, 'Computer Organization' 2nd edition

EE 8051
SIMULATION OF ELECTRICAL SYSTEMS LABORATORY

Lecture	: -	**Internal Assessment**: 25
Tutorial	: -	**Final Examination**: 50
Practical	: 3 hrs/ week	**Credits**: 2

Course Objectives:
The objective of the Lab is to appreciate and use various software tools in Electrical Engineering for Modeling and Simulation of different Power Systems and Power Electronic circuits in lesser time.

Learning Outcomes:
After successful completion of the course, the students will be able to use the MATLAB Programming and PSPICE programming for the Modeling and Simulation of various Electrical circuits. Students will also get exposure to the use of Graphical User Interfaces like SIMULINK and MI-Power for the Modeling and Simulation.

LIST OF EXPERIMENTS:

1. Simulation of a single-phase full-bridge converter with different loads
2. Simulation of static characteristics of SCR
3. Simulation of a resonant pulse commutation circuit and buck chopper
4. Simulation of an AC voltage controller with various loads
5. Simulation of a single-phase/three phase Cycloconverters with different loads
6. Simulation of single-phase inverter with PWM control
7. Simulation of 3-phase power system network consisting generator, transmission line & load
8. Transfer function analysis of a given circuit using MATLAB & SIMULINK
9. State model representation of transfer functions using MATLAB & SIMULINK
10. Design of control system with Root-locus method using MATLAB & SIMULINK
11. Stability analysis using Bode, Nyquist plots
12. Load flow studies using simulation tool
13. Short circuit studies in power systems using Simulation tool
14. Steady state stability analysis of power systems using Simulation tool
15. Relay co-ordination in power systems using Simulation tool

Note: A minimum of 10 (Ten) experiments have to be completed to attain eligibility for Practical Examinations.

EE 8052
PROJECT WORK

Lecture	: 2 hrs/ week	**Internal Assessment**:	50
Tutorial	: 6 hrs/ week	**Final Examination**:	100
Practical	: 10 hrs/ week	**Credits**:	12

Course Objective:

- Implementation of the problem identified in Term Paper EE7053
- Application of theory learned so far in Electrical and Electronics Engineering
- Make use of research tools and material
- Consolidation of Hardware/Software skills for a real world /research problem
- Improve problem solving skills
- Improve report writing, word processing skills and documentation skills

Learning Outcomes:

Exposure to research and development procedures, latest developments in the selected areas, software development, development of a prototype, solution to industrial/ theoretical problems and publication of research paper in National or International conference.

Distribution of Marks:

Internal Evaluation: 50

Attendance	:	05
Seminar1	:	10
Seminar2	:	10
Viva& draft report	:	25

External Evaluation: 100

Report	:	60
Seminar	:	20
Viva	:	20

GUIDELINES FOR PREPARING THE PROJECT REPORT FOR B.TECH

Size: The project report should be submitted in A4 size.

Number of copies to be submitted: 3 + No. of team members.

Paper, Typing, Format:

1. Bond paper should be used for the preparation of the Project Report. Typing should be done on the Times new Roman 12 point size letters.
2. The layout should provide a margin of 2" on the left, 1" on the top, bottom and right.
3. Fresh para should commence after five spaces. 1.5 line spacing shall be provided throughout the report. The page numbers shall be indicated at the bottom-middle of each page.

Binding:

The Dissertation shall be properly bound; using rexine of **sky blue** colour otherwise it will be rejected. The bound front cover should indicate in **black** embossed letter the following:

1). ……16 point size . . . . . .

(Title)

A Project Report Submitted to

JNTU, KAKINADA

In partial fulfillment of the requirements for the award of degree of

BACHELOR OF TECHNOLOGY

with specialization in

ELECTRICAL AND ELECTRONICS ENGINEERING.

2). . . . . by. . . . . .

(Name) & (Roll.No)

COLLEGE LOGO

4) Bottom:

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
VR SIDDHARTHA ENGINEERING COLLEGE
(Autonomous)
VIJAYAWADA-520007
April 2010

5) The bound-side must indicate B.Tech, name of the candidate, and year.
Two plain blank papers should be provided at the beginning and at the end.

Third page: Same as cover page

Fourth page: The Fourth page should contain a certificate signed by the Guide in the following format.

CERTIFICATE

This is to certify that the project report entitled . . . . . that is being submitted by Sri/Ms. . . . . in partial fulfillment for the award of the Degree of Bachelor of Technology in . . . . . to the JNTUK, KAKINADA is a record of bona fide work carried out by ----------under my guidance and supervision. The results embodied in this project report have not been submitted to any other University or Institute for the award of any degree.

SIGNATURE OF THE GUIDE: **HEAD OF THE DEPARTMENT**
NAME **NAME**
Date Date:

Fifth page: The fifth page may include the '**Acknowledgment'.**

Sixth page: The sixth page may contain an abstract of the Project report. The candidate may emphasize here his contributions.

Page 7th & 8th: In these pages, candidate must provide a table of contents, list of tables, list of figures and photographs and notation.

NOTE: All the above pages are to be numbered in Roman numerals of lower case.

Arrangement of Chapters:

The following is the suggested format for arranging the project report matter into various Chapters.

1. Introduction
2. Literature Survey/Review of Literature
3. Theoretical Analysis
4. Experimental Investigations
5. Experimental Results
6. Discussion of Results
7. Summary, conclusions & Recommendations
8. References/Bibliography
9. Appendices (if any).

The arrangement of paragraph in a Chapter.

Each section in a chapter should be properly numbered for example, 2.1, 2.2 etc., where the first digit represents the Chapter Number and second digit the section number. There is no need to indicate the number for the first section in a chapter.

Sub-section, if any, may be indicated as 1.1.1, 1.1.2 . . . etc i.e., the first digit representing the chapter, the second representing the section and the third representing the sub-section.

Photographs, Figures and Tables: The photographs, figures and tables occurring in a chapter may be serially numbered as Fig.1.1, 1.2 etc., where the first digit represents the chapter, the second digit represents figure number. The photographs may be represented as photo 1.1, 1.2 etc., the first digit representing chapter and the second representing the photograph number.

Graphs: The graph should clearly indicate the points which are used for drawing the curve or curves. The points may be indicated by the following symbols. All the letters in the graphs should be written with stencils.

Bibliography or References: The following format may be used for writing the Bibliography/References. It is preferred that in the text - the author and the year of publication is quoted without serial number. At the end of report where the listing of references is done, the list should be made strictly in alphabetic order of the name of the authors.