

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(Autonomous)**

(Affiliated to J.N.T. University Anantapur, Anantapur).

**ACADEMIC REGULATIONS**

**B.Tech Regular Four Year Degree Program**

(For the batches admitted from the academic year 2012-13)

And

**B.Tech (Lateral Entry Scheme)**

(For the batches admitted from the academic year 2013-14)

- All the rules specified herein, approved by the Academic Council, Will be in force and applicable to students admitted from the academic year 2012-2013 onwards.
- 1. Applicability :** Any reference to "College" in these rules and regulations stands for Sri Venkateswara College of Engineering and Technology (Autonomous).
- All the rules and regulations, specified herein after shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the
- 2. Extent: :** Chairman, Academic Council is final. As per the requirements of statutory bodies, Principal, Sri Venkateswara College of Engineering and Technology shall be the Chairman, of the Academic Council.
- 3. Admission :**
- 3.1 Admission in to first year of Four Year B.Tech Degree Program of study in Engineering:**
- 3.1.1 Eligibility :** A candidate seeking admission into the first year of Four year B.Tech Degree Program should have
- Passed either Intermediate Public Examination conducted by the Board of Intermediate Education, Andhra Pradesh, with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination recognized by Board of Intermediate Education and JNTU Anantapur) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or equivalent Diploma recognized by State Board of Technical Education, govt. of A.P and JNTU Anantapur) for admission.

- As per the existing stipulations of A.P State Council of Higher Education (APSCHE), Government of Andhra Pradesh,
- 3.1.2 Admission Procedure** : admissions are made into the first year of Four year B.Tech. Degree Program as follows:

A – Category & B – Category seats are filled as per the norms prescribed by the Govt. of A.P. from time to time.

**3.2 Admission into the second year of Four Year B.Tech. Degree Program in Engineering:**

- 3.2.1 Eligibility** : Candidates qualified in ECET (FDH) and admitted by the Convener, ECET (FDH).

In all such cases for admission, when needed, Permissions from the statutory bodies are to be obtained.

- 3.2.2 Admission Procedure** : Lateral Entry seats are filled as per the norms prescribed by the Govt. of A.P. from time to time.

**4. Programs of study offered leading to the award of B.Tech degree**

1. B.Tech (Civil Engineering)
2. B.Tech (Computer Science & Engineering)
3. B.Tech (Electrical & Electronics Engineering)
4. B.Tech (Electronics & Communication Engineering)
5. B.Tech (Information Technology)
6. B.Tech (Mechanical Engineering)

- 5. Academic Year** : The College shall follow Yearly Pattern for first year course and semester pattern from second year onwards.
- The first year of Four year B.Tech Program shall have a minimum of 32 instructional weeks. From second year onwards each semester shall have a minimum of 16 instructional weeks.

**6. Course Structure :** Each Program of study shall consist of:

- **General subjects comprising of the following: (5 to 10%)**

- English Language /Communication Skills / Mind Skills
- Humanities and Social Sciences
- Economics
- Principles of Management

The above courses are common to all Branches.

- **Basic science subjects comprising of the following: (15 to 25%)**

- Computer Literacy with Numerical Analysis
- Mathematics
- Physics
- Chemistry

The above courses are common to all branches.

- **Basic Engineering subjects comprising some of the following, depending upon the branch: (15 to 25%)**

- Engineering Drawing
- Engineering & IT workshop
- Engineering Mechanics
- Basic Mechanical Engineering
- Electrical & Electronics Engineering
- Computer Programming

- **Core Subjects: (45 to 55%)**

The list of professional subjects are chosen as per the suggestions of the experts to impart broad based knowledge needed in the concerned branch of study.

- **Elective subjects: (10 to 15%)**

Electives will be offered to the students to diversify the spectrum of knowledge. These electives can also be chosen from outside the main discipline, based on the interest of the student to broaden his individual skill and knowledge.

**The students shall complete:**

A mini project in an industry during the summer term following the second semester of third year B. Tech Program for a period of 4 weeks. A report shall be submitted to Department after successful completion of the mini project, during IV year I semester.

A Main project in the institution / industry during IV year II semester for a period of one semester. A report shall be submitted to the department after successful completion of the main project.

**7. Credit System** : Credits are assigned based on the following norms.

Subject	Yearly Pattern		Semester Pattern	
	Periods / Week	Credits	Periods / Week	Credits
Theory	01	02	01	01
Practical	03	04	03	02
Mini Project	--	--	--	02
Seminar	--	--	--	02
Comprehensive Viva - Voce	--	--	--	02
Final Year Project	--	--	--	10

- i. As a norm, for the theory subjects, **one credit** for one contact period per week is assigned in semester system. In yearly pattern **two credits** for one contact period per week is assigned.
- ii. As a norm, for practical courses **two credits** will be assigned for three contact periods per week in semester pattern. In yearly pattern **four credits** will be assigned for three contact periods per week.
- iii. Tutorials do not carry any credits. However, each of the analytical and problem oriented courses will have one tutorial period per week.
- iv. For Mini project/Project/Seminar/Comprehensive Viva-Voce, where formal contact hours are not specified, credits are assigned based on the complexity of the work to be carried out.
  - The four year curriculum of any B.Tech, Program of study shall have a total of 224 credits.
  - In the case of lateral entry students, B.Tech. program of study shall have a total of 172 credits.
  - The exact requirements of credits for each subject will be as recommended by the concerned Board of Studies and approved by the Academic Council.

- 8. Examination System** : All components in any Program of study will be Evaluated continuously through internal evaluation and an external evaluation component conducted as year/semester-end examination.

### 8.1 Distribution of Marks:

S.NO	Examination	Marks %	Examination and Evaluation		Scheme of examination
1	Theory	70	Year/Semester-end examination (external Paper setting and evaluation)		This Examination question paper in theory subjects will be for a maximum of 70 marks. The question paper shall be of descriptive type with 8 questions (one question from each unit) out of which 5 are to be answered in 3 hours duration of the examination.
		30	20	Mid-Examination of 120 Min. duration (Internal evaluation). The question paper shall be of descriptive type with 5 questions out of which 4 are to be answered and evaluated for 20 marks.	<p><b>In Yearly Pattern:</b> Three (03) mid – term exams, each for 20 marks are to be conducted. Average of the best two mid-term exams shall be considered.</p> <p><b>Mid-I:</b> After first spell of instructions (I to II Units).</p> <p><b>Mid-II:</b> After second spell of instructions (III to V Units).</p> <p><b>Mid-III:</b> After third spell of instructions (VI to VIII Units)</p> <p><b>In Semester pattern:</b> Two (02) mid-term exams, each for 20 marks are to be conducted. Better of the two shall be considered.</p> <p><b>Mid-I:</b> After first spell of instructions(I to IV Units)</p> <p><b>Mid-II:</b> After second spell of instructions (V to VIII Units.)</p>

				Assignment (Internal evaluation)	<p><b>In yearly pattern:</b> Three assignments shall be given and each will be evaluated for 10 marks Average of four Assignments shall be taken as internal marks for the assignments.</p> <p><b>In Semester pattern:</b> Two assignments shall be given and each will be evaluated for 10 marks. Average of two Assignments shall be taken as internal marks for the assignments.</p>
2	Laboratory	50	Year/ Semester-end Lab Examination (External evaluation)		50 marks are allotted for laboratory examination during year/semester-end.
		25	15	Continuous evaluation	Performance in laboratory experiments and Record.
			10	Internal evaluation	Practical Test at the end of the year / semester
3	Drawing	50	Year/ Semester-end drawing Examination (External evaluation)		50 marks are allotted for drawing examination during year/semester-end.
		50	30	Continuous evaluation	Performance in Drawing classes
			20	Internal evaluation	Practical tests (for yearly pattern three tests will be conducted. Average of best two will be taken. In semester pattern two tests will be conducted. Better of the two will be taken.
4	Seminar	50	Internal Evaluation		Evaluation during a semester by the Departmental Committee (DC).

5	Comprehensive Viva-Voce	100	Internal Evaluation		Viva-voce examination conducted at the end of IV year II Sem.
6	Mini Project	50	Internal evaluation		Evaluation by the DC
7	Project Work	200	150	External evaluation	Semester-end Project Viva-Voce Examination by a Committee as detailed under 8.2.
			50	Internal evaluation	Continuous evaluation by the DC

**8.2 Project Work :** The Semester-End Examination (Viva-voce) shall be conducted by a Committee consisting of External examiner (nominated by the Chief Controller of Examinations), HOD, & Supervisor. The evaluation of project work shall be conducted at the end of the IV year second semester. The Internal Evaluation shall be made by the Departmental Committee, on the basis of two project reviews of each student.

**8.3 Eligibility to appear for the year/ Semester-End examination:**

**8.3.1** A student shall be eligible to appear for year-end / Semester –End examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a year / semester.

**8.3.2** Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in first year or each semester may be granted on medical grounds by the College Academic Committee. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

**8.3.3** Shortage of Attendance below 65% in aggregate shall in no case be condoned and the candidate will be detained.

**8.3.4** Detained students are not eligible to take their end examination of that class and their registration shall stand cancelled.

**8.3.5** A student detained due to shortage of attendance, will have to repeat that year / semester when offered next.

**8.4 Evaluation: Following procedure governs the evaluation.**

**8.4.1** The marks for the internal evaluation components will be added to the external evaluation marks secured in the Year/Semester –End examinations, to arrive at total marks for any subject in that Year/semester.

**8.4.2** Performance in all the subjects is tabulated program-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, and subject-wise marks lists are finalized. Total marks obtained in each subject are converted into letter grades.

**8.4.3** Student-wise tabulation is done and student-wise Grade Sheet is generated and issued to the students.

**8.5 Revaluation / Recounting:**

Students shall be permitted for request for recounting/revaluation of the year / Semester-End examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the same will be intimated to the students.

**8.6 Supplementary Examination:**

**8.6.1** In addition to the regular year/ Semester- End examinations conducted, the College may also schedule and conduct supplementary examinations for all the subjects of other year/ semesters when feasible for the benefit of students. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

**8.6.2** If any candidate fails to secure pass marks in the Seminar / Comprehensive Viva-Voce / Mini Project, he can be permitted to register for supplementary examinations.

**9. Academic Requirements for Promotion/ completion of regular B.Tech Program of study:**

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion/completion of regular B.Tech Program of study.

**9.1 For students admitted in B.Tech (Regular) Program:**

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design drawing subject or project if he secures not less than 35% of marks in the year / Semester End examination and a minimum of 40% of marks in the sum total of the internal evaluation and year / Semester-End examination taken together. For the seminar, mini project and comprehensive viva he should secure 40% of marks in the internal evaluation.

ii. A student shall be promoted from second year to third year only if he fulfills the academic requirement of securing 54 credits from:

a) Two Regular and One Supplementary examinations of I year.

b) One Regular and One Supplementary examination of Second year I semester.

c) One Regular Examination of Second year II semester.

Irrespective of whether the candidates appear for Semester-End examination or not as per the normal course of study.

**iii.** A student shall be promoted from third year to fourth year Program of study only if he fulfills the academic requirements of securing 82 credits from:

a) Three regular and two supplementary examinations of first year

b) Two regular and two supplementary examination of second year first semester.

c) Two regular and one supplementary examinations second year second semester.

d) One regular and one supplementary examination of third year first semester.

e) One Regular Examination of Third year II semester.

Irrespective of whether the candidate appears for the Semester-End examination or not as per the normal course of study and in case of getting detained for want of credits by sections 9.1(ii) and 9.1 (iii) above, the student may make up the credits through supplementary examinations before the date of commencement of class work for III year I semester or IV year I semester as the case may be.

**iv.** A student shall register for all the 224 credits and *earn* all the 224 credits. Marks obtained in all the 224 credits shall be considered for the award of the class based on CGPA.

**v.** A student who fails to earn 224 credits as indicated in the course structure within **eight** academic years from the year of their admission shall forfeit his seat in B. Tech. Program and his admission stands cancelled.

## **9.2 For Lateral Entry Students (batches admitted from 2013-2014):**

**i.** A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the Semester-End examination and a minimum of 40% of marks in the sum total of the internal evaluation and Semester-End examination taken together. For the Seminar he should secure 40% of marks in the internal evaluation.

**ii.** A student shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing 56 credits from the following examinations.

a) Two regular and two supplementary examinations of II year I semester.

b) Two regular and one supplementary examination of II year II semester.

- c) One regular and one supplementary examination of III year I semester.
- d) One Regular Examination of Third year II semester.

Irrespective of whether the candidate appear the Semester-End examination or not as per the normal Course of study and in case of getting detained for want of credits the student may make up the credits through supplementary exams of the above exams before the date of commencement of class work for IV year I semester.

- iii. A student shall register for all 172 credits and earn all the 172 credits. Marks obtained in all 172 credits shall be considered for the award of the class based on CGPA
- iv. A student who fails to earn 172 credits as indicated in the Course structure within **six** academic years from the year of their admission shall forfeit his seat in B.Tech. Program and his admission stands cancelled.

#### 10. **Transitory Regulations:**

Students who got detained for want of attendance (**or**) who have not fulfilled academic requirements (**or**) who have failed after having undergone the course in earlier regulations (**or**) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (**or**) equivalent subjects as and when subjects are offered and they continue to be in the academic regulations of the batch they join later.

A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of **eight years**, and a lateral entry student within **six years**, for the award of B.Tech Degree.

#### 11. **Grades, Grade Point Average and Cumulative Grade Point Average**

- 11.1 **Grade System** : After all the components and sub-components of any subject (including laboratory subjects) are evaluated, the final total marks obtained will be converted to letter grades on a "**10 point scale**" described below.

<b>% of marks obtained</b>	<b>Grade</b>	<b>Grade Points(GP)</b>
90 to 100	A+	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
50 to 59	D	6
40 to 49	E	5
Less than 40 in Sum of Int. and Ext. (or) Less than 25 in Ext.	F	0
Not Appeared	N	0

- **Pass Marks:** A student is declared to have passed theory and/ or laboratory subject, if he secures minimum of 35% marks in external examination, and a minimum of 40% marks in the sum total of internal evaluation and external examination taken together. Otherwise he will be awarded fail grade – **F** in such subject irrespective of internal marks.
- **F** is considered as a fail grade indicating that the student has to pass the year / semester-end examination in that subject in future and obtain a grade other than **F** and **N** for clearing this subject.

### 11.2 Grade Point Average (GPA):

Grade Point Average (GPA) will be calculated as given below on a "10 Point scale" as an Index of the student's performance at the end of I year / each semester:

$$\mathbf{GPA} = \frac{\sum(CXGP)}{\sum c}$$

Where C denotes the credits assigned to the subjects undertaken in that Year/ semester and **GP** denotes the grade points earned by the student in the respective subjects.

### 11.3 Cumulative Grade Point Average (CGPA):

At the end of every year / semester, a Cumulative Grade Point Average (CGPA) on a 10 Point scale is computed considering all the subjects passed up to that point as an index of overall Performance up to that Point as given below:

$$\mathbf{CGPA} = \frac{\sum(CXGP)}{\sum c}$$

Where C denotes the credits assigned to subjects undertaken upto the end of the current year/semester and GP denotes the grade points earned by the student in the respective courses.

**11.4 Grade Sheet:** A grade sheet (Marks Memorandum) will be issued to each student Indicating his performance in all subjects registered in that year/ semester Indicating the GPA and CGPA. GPA and CGPA will be rounded off to the second place of decimal.

**12. Transcripts:** After successful completion of the entire Program of study, a transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued, if required, after payment of requisite fee.

**13. Award of Degree :** The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Anantapur on the recommendation of The Principal of SVCET (Autonomous).

**13.1 Eligibility :** A student shall be eligible for the award of B.Tech. Degree if he fulfills all the following conditions:

- Registered and successfully completed all the components prescribed in the program of study for which he is admitted.
- Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- Obtained CGPA greater than or equal to 5.0 (Minimum requirement for declaring as passed.)

**13.2 Award of Class :** Declaration of Class is based on CGPA.

Cumulative Grade Point Average	Class
$\geq 7.0$	First Class with Distinction
$\geq 6.0$ and $< 7.0$	First Class
$> 5.0$ and $< 6.0$	Second Class
5.0	Pass Class

**14. WITH – HOLDING OF RESULTS:** If the candidate has not paid dues to the university/ college or if any case of in-discipline is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

**15. Additional academic regulations:**

- i. A regular student has to complete all the eligibility requirements within the maximum stipulated period of **eight** years, and a lateral entry student within **six** years.
- ii. A student can appear for any number of supplementary examinations till he clears all subjects within the stipulated period.
- iii. A grade sheet (marks memorandum) will be issued to the student indicating his performance in all the courses of that year /semester along with the GPA and CGPA.
- iv. A transcript containing the performance in all the components required for eligibility for award of the Degree will be issued to the student.
- v. Any canvassing / impressing the administration, examiners, faculty or staff in any form, the candidate is liable for punishment as per the mal practice rules appended here with.

- vi.** When a student is absent for any examination (internal or external) he is treated as to have appeared and obtained **zero** marks in that component (course) and grading is done accordingly.
- vii.** When a component is cancelled as a penalty, he is awarded zero marks in that component.

**16. Amendments to regulations:**

The Academic Council Sri Venkateswara College of Engineering and Technology (Autonomous) reserves the right to revise, amend, or change the Regulations, Scheme of Examinations, and / or Syllabi or any other Policy relevant to the needs of the society or industrial requirements etc., without prior notice.

**17. General:**

Where the words "he", "him", "his", "himself" occur in the regulations, they include "she", "her", "herself".

**Note: Failure to read and understand the regulations is not an excuse.**

**Sri Venkateswara College of Engineering and Technology**  
**R.V.S. Nagar, Chittoor**

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**Identification of Courses**

**B. Tech**

Each course shall be uniquely identified by an alphanumeric code of width 7 characters as given below.

<b>No. of digits</b>	<b>Description</b>
First two digits	Year of regulations Ex:12
Next one letter	Type of program: A: B. Tech B: M. Tech C: M.B.A D: M.C.A
Next two letters	Code of department: HS/CE/CS/EE/EC/IT/ME/MB/MC
Last two digits	Indicate serial numbers: $\geq 01$

**Ex: I Year Course:**

12AHS01  
12AHS02  
12AHS03  
12AHS04  
12ACS01  
12AEE01  
12AEC01  
12ACE01  
12AME01  
12AHS05  
12ACS02  
12AME02  
12AHS06

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(AUTONOMOUS)**  
**(AFFILIATED TO JNTUA, ANANTAPUR)**  
**RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT**  
**IN EXAMINATIONS**

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

3.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

6.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The candidate is also debarred and forfeits of seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.

8.	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction or property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.  Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.

10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Examination committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**R.V.S. NAGAR, TIRUPATI ROAD, CHITTOOR-517127. A.P**

**SCHEME OF INSTRUCTIONS FROM I YEAR B.TECH TO IV YEAR B.TECH (EEE)**

**I B.Tech**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AHS01	Technical English	2	-	-	4	30	70	100
2	12AHS02	Engineering Mathematics-I	3	1	-	6	30	70	100
3	12AHS03	Engineering Physics	2	-	-	4	30	70	100
4	12AHS04	Engineering Chemistry	2	-	-	4	30	70	100
5	12ACS01	Programming in C & Data structures	3	1	-	6	30	70	100
6	12AEE01	Electrical Circuits	3	1	-	6	30	70	100
7	12AME01	Engineering Drawing	2	-	4	6	50	50	100
8	12AHS05	Engineering Physics & Engineering Chemistry Lab	-	-	3	4	25	50	75
9	12ACS02	Computer Programming Lab	-	-	3	4	25	50	75
10	12AME02	Engineering & IT Workshop	-	-	3	4	25	50	75
11	12AHS06	English Language & Communication Skills Lab	-	-	3	4	25	50	75
<b>Total</b>			<b>17</b>	<b>3</b>	<b>16</b>	<b>52</b>	<b>330</b>	<b>670</b>	<b>1000</b>

**II B.Tech I Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AHS07	Engineering Mathematics -II	4	1	-	4	30	70	100
2	12AEE03	Electromagnetic Fields	4	1	-	4	30	70	100
3	12ACE08	Fluid Mechanics and Hydraulic Machinery	4	1	-	4	30	70	100
4	12AEC07	Principles of Electronic Devices and Circuits	4	1	-	4	30	70	100
5	12AEE04	Electrical Machines -I	4	1	-	4	30	70	100
6	12AEE05	Generation of Electric Power	4	1	-	4	30	70	100
7	12ACE09	Basic Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	2	25	50	75
8	12AEE06	Electrical Circuits & Simulation Lab	-	-	3	2	25	50	75
<b>Total</b>			<b>24</b>	<b>6</b>	<b>6</b>	<b>28</b>	<b>230</b>	<b>520</b>	<b>750</b>

**II B.Tech II Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AHS09	Environmental Studies	4	1	-	4	30	70	100
2	12AHS10	Engineering Mathematics -III	4	1	-	4	30	70	100
3	12AEE11	Transmission of Electrical Power	4	1	-	4	30	70	100
4	12AEC15	Analog Electronic Circuits	4	1	-	4	30	70	100
5	12AEC12	Switching Theory and Logic Design	4	1	-	4	30	70	100
6	12AEE12	Electrical Machines -II	4	1	-	4	30	70	100
7	12AEC05	Electronic Devices & Circuits Lab	-	-	3	2	25	50	75
8	12AEE13	Electrical Machines -I Lab	-	-	3	2	25	50	75
<b>Total</b>			<b>24</b>	<b>6</b>	<b>6</b>	<b>28</b>	<b>230</b>	<b>520</b>	<b>750</b>

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(AUTONOMOUS)  
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SCHEME OF INSTRUCTIONS FROM I YEAR B.TECH TO IV YEAR B.TECH (EEE)**

**III B.Tech I Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AHS11	Managerial Economics and Financial Analysis	4	1	-	4	30	70	100
2	12AEC25	Linear and Digital IC Applications	4	1	-	4	30	70	100
3	12AEE16	Electrical Machines-III	4	1	-	4	30	70	100
4	12AEE17	Control Systems	4	1	-	4	30	70	100
5	12AEE18	Signals & Systems	4	1	-	4	30	70	100
6	12AEC22	Microprocessors and Microcontrollers	4	1	-	4	30	70	100
7	12AEE19	Electrical Machines-II Lab	-	-	3	2	25	50	75
8	12AEE20	Control Systems & Simulation Lab	-	-	3	2	25	50	75
<b>Total</b>			<b>24</b>	<b>6</b>	<b>6</b>	<b>28</b>	<b>230</b>	<b>520</b>	<b>750</b>

**III B.Tech II Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AEE21	Power Electronics	4	1	-	4	30	70	100
2	12AHS12	Management Science	4	1	-	4	30	70	100
3	12AEE22	Soft Computing Techniques	4	1	-	4	30	70	100
4	12AEC28	Digital Signal processing	4	1	-	4	30	70	100
5	12AEE23	Switch Gear & Protection	4	1	-	4	30	70	100
6	12AEE24	Electrical Measurements and Instrumentation	4	1	-	4	30	70	100
7	12AEE25	Electrical Measurements and Instrumentation Lab	-	-	3	2	25	50	75
8	12AEC31	Microprocessor and Microcontrollers Lab	-	-	3	2	25	50	75
9	12AEE26	Seminar	-	-	-	2	50	-	50
<b>Total</b>			<b>24</b>	<b>6</b>	<b>6</b>	<b>30</b>	<b>280</b>	<b>520</b>	<b>800</b>

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**SCHEME OF INSTRUCTIONS FROM I YEAR B.TECH TO IV YEAR B.TECH (EEE)**

**IV B.Tech I Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AEE27	Power System Analysis	4	1	-	4	30	70	100
2	12AEE28	Power Semi conductor Drives	4	1	-	4	30	70	100
3	12AEE29	Power System Operation and Control	4	1	-	4	30	70	100
4	12AEE30	Design of Electrical Systems	4	1	-	4	30	70	100
5		<b>ELECTIVE I</b>	4	1	-	4	30	70	100
	12AEE31	1. HVDC Transmission							
	12AEE32	2. Distribution of Electric Power & Smart Grid Technology							
	12AEE33	3. EHV AC Transmission							
6		<b>ELECTIVE II</b>	4	1	-	4	30	70	100
	12AEE34	1. Advanced control systems							
	12AEE35	2. Optimization Techniques							
	12AEE36	3. Programmable logic control							
7	12AEE37	Power Electronics & Simulation Lab	-	-	3	2	25	50	75
8	12AEE38	Power systems and Simulation Lab	-	-	3	2	25	50	75
9	12AEE39	Mini Project	-	-	-	2	50	-	50
<b>Total</b>			<b>24</b>	<b>6</b>	<b>6</b>	<b>30</b>	<b>280</b>	<b>520</b>	<b>800</b>

**IV B.Tech II Semester**

S.No	Code	Subject	Periods			Credits	Scheme of Examination (Maximum Marks)		
			L	T	P		Internal	External	Total
1	12AEE40	Utilization of Electrical Energy	4	1	-	4	30	70	100
2		<b>ELECTIVE III</b>	4	1	-	4	30	70	100
	12AEE41	1. Energy Auditing and Demand side Management							
	12AEE42	2. Electrical Machine Design							
	12AEE43	3. FACTS and Custom Power Devices							
3		<b>ELECTIVE IV</b>	4	1	-	4	30	70	100
	12AEE44	1. Special Electrical Machines							
	12AEE45	2. Renewable Energy sources							
	12AEE46	3. Power systems Deregulation							
4		<b>ELECTIVE V</b>	4	1	-	4	30	70	100
	12AEE47	1. High Voltage Engineering							
	12AEE48	2. Inter-connected Power systems							
	12AEE49	3. Power system Dynamics and stability							
5	12AEE50	Comprehensive Viva voce	-	-	-	2	100	-	100
6	12AEE51	Project	-	-	-	10	50	150	200
<b>Total</b>			<b>16</b>	<b>4</b>	<b>-</b>	<b>28</b>	<b>270</b>	<b>430</b>	<b>700</b>

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY**  
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**PROGRAM EDUCATION OBJECTIVES AND OUTCOMES**

An Electrical and Electronics Engineering program will ensure that its graduates understand the basic concepts of science and mathematics in depth to appreciate and use its methodologies of analysis and design. The students will acquire skills for life-long learning. Therefore it has a mission statement which is in conformity with the mission statement of the organization. This mission was translated into specific program objectives and program outcomes that are expected of the education process. The outcomes of a program which are measurable and will be assessed regularly through proper feedback for improvement of the programme. Therefore the Curriculum must be constantly refined and updated to ensure that the defined objectives and outcomes are achieved.

**A) Program Educational Objectives (PEO's):**

The educational objectives of a programme are the statements that describe the expected achievements of graduates within first few years of their graduation from the programme. The programme objectives are guided by global and local needs, vision of the institution, long term goals etc. For defining the programme objectives the faculty members of the programme must continuously work with local employers, industry and R & D advisors and the alumni. The objective of a programme can be broadly defined as follows:

- I. Preparation:** To prepare students to excel in postgraduate programs or to succeed in industry/technical profession through global and rigorous education.
- II. Core Competence:** To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve engineering problems and also pursue higher studies.
- III. Breadth:** To train students with good scientific and engineering breadth so as to comprehend, analyze, design and create novel products and solutions for the real life problems.
- IV. Professionalism:** To inculcate in student professional and ethical attitude, effective communication skills, team works skills, multidisciplinary approach and an ability to relate engineering issues to broader social context.
- V. Learning Environment:** To provide student with an academic environment aware of excellence, leadership, written ethical codes, guidelines and life-long learning needed for a professional career.

**B) Program outcomes:** The Programme outcomes are the skills and knowledge which the students have at time of graduation. Electrical and Electronics Engineering graduates will become successful practicing Engineers, with the knowledge of subjects in Mathematics, Science and Engineering disciplines.

**The Graduates will be able to:**

- Learn communication skills, analytical skills and problem solving skills to identify, formulate and solve engineering problems.
- Acquire the ability to analyze scientific and engineering problems, conduct experiments, analyze and interpret data.
- Visualize and work in the laboratory using modern engineering tools and softwares to analyze the problems.
- Develop the confidence for self education and work in multi disciplinary teams. They acquire knowledge of professional ethics.

**OUTCOME A:** The student will be able to:

- Acquire knowledge of mathematical Methods applicable to science and Engineering, the analysis of electrical circuits which is the basic foundation for all subjects in electrical engineering discipline and also the basic principles of fluid mechanics and hydraulic machines.

**OUTCOME B:** The student will be able to:

- Understand the concepts of Block diagram reduction techniques, time and frequency domain analysis applicable to control systems, principles of Electrical and Electronic measuring instruments, magnetic measurements, transducers and their applications, measurements of Non-Electrical quantities.
- Gain knowledge of power semiconductor devices used for all types of controlled converters used in variable speed AC & DC drives and different control methods of AC & DC drives used in industrial and domestic applications.

**OUTCOME C:** The student will be able to:

- Gain the fundamental concepts and basic methods of design of digital circuits, transistors, FETS such as MOSFET, JFET and their applications in electronic circuits, the characteristics of tunnel diode, Schottky diode.
- Understand the basic concepts of linear integrated circuits and their applications, analog and digital circuits such as amplifiers and multivibrators.
- Acquire knowledge of VHDL in the analysis of digital systems.

**OUTCOME-D:** The student will be able to:

- Acquire the basic knowledge of Electrical Machines and characteristics of motors and generators.
- Design and fabricate Electrical Machines and transformers with good cooling systems and modern controls.
- Gain the knowledge about Electrical Power Generation and Transmission with modern controllers.
- Capture the knowledge of Special Electrical Machines which are used in industry and domestic appliances.
- Design and develop advanced Digital Signal Processors which are applicable for modern traction and traffic signal systems.

**OUTCOME-E:** The student will be able to:

- Understand the Electric and magnetic fields used in power transmission lines and electrical machines.
- Gain the knowledge of Modeling and Protection of Power Systems.
- Know the Economic operation of power systems, optimal scheduling, load frequency control, concept of reactive power control with compensation techniques and power system restructuring.
- Understand the different types of breakdown mechanisms, the methods of generation and measurement of high DC, AC and impulse voltages and currents, and also various high voltage tests and non destructive tests on insulating materials and all electrical equipments.
- Know about converters which are widely used in HVDC transmission systems, necessity of EHVAC transmission and its parameters, interconnected power systems and planning of power system operation.
- Understand the various types of electricity market operational and control issues.
- Know the modeling of turbine, excitation system, speed governing system, and also implementation of real coded power systems and machines with dynamic stability.

**OUTCOME-F:** The student will be able to:

- Gain knowledge of fundamentals of C programming and data structures.
- Acquire knowledge on soft computing techniques which are used to realize the custom power devices with good stability and reliability.
- Gain knowledge of the real time processors and controllers to implement the control of the electrical systems used in industrial and domestic applications.

- Design electrical power transmission and distribution combined with smart grid technology, like wind, solar, biomass etc and understand state variable techniques applicable to analysis of linear and nonlinear systems.
- Learn the application of linear programming, dynamic programming for the analysis of large systems and advanced PIC controllers which are applicable for control Electric drives.

**OUTCOME-G:** The student will be able to:

- Gain the knowledge of professional and ethical responsibilities.
- Understand the impact of engineering solutions on society and aware of contemporary issues.
- Develop the confidence for self education and ability for lifelong learning.

**OUTCOME-H:** The student will be able to:

- Learn effectively verbal and technical writing skills
- Acquire the communication skills so that they will be able to communicate technical knowledge through English.

**OUTCOME-I:** The student will be able to:

- Acquire the knowledge about electric power utilization which are used in illumination, electric heating, electric welding and electrolytic process.
- Gain knowledge on energy Audit, conservation and Management.
- Develop methods of increasing energy efficiency which will be able to conserve energy and reduce energy related costs.
- Gain knowledge about electrical power generation from Non-Conventional energy sources like solar, wind, biomass, geothermal and tidal plants.

**OUTCOME-J:** The student will be able to:

- Develop confidence for self education and ability for life-long learning
- Develop skills to participate and succeed in competitive examinations and higher educations

<b>Outcome-(A)</b>	
12AEE01	Electrical Circuits
12AHS02	Engineering Mathematics-I
12AHS03	Engineering Physics
12AHS04	Engineering Chemistry
12AHS05	EP & EC Lab
12AEE06	Electrical Circuits & Simulation Lab
12AHS07	Engineering Mathematics-II
12ACE08	Fluid Mechanics and Hydraulic Machines
12ACE09	FMHM Lab
12AHS10	Engineering Mathematics-III

<b>Outcome-(B)</b>	
12AEE17	Control Systems
12AEE18	Electrical Measurements & Instrumentation
12AEE21	Power Electronics
12AEE25	Electrical Measurements Lab
12AEE28	Power Semiconductor Drives
12AEE37	Power Electronics & Simulation Lab

<b>Outcome-(C)</b>	
12AEC02	Switching Theory and Logic Design
12AEC05	Electronic Devices & Circuits Lab
12AEC07	Principles Of Electronic Devices & Circuits
12AEC15	Analog-Electronic Circuits
12AEE20	Control Systems & Simulation Lab
12AEC25	Linear and Digital IC Applications

<b>Outcome-(D)</b>	
12AEE04	Electrical Machines-I
12AEE05	Generation of Electric Power
12AEE11	Transmission of Electrical Power
12AEE12	Electrical Machines-II
12AEE13	Electrical Machines Lab - I
12AEE16	Electrical Machines-III
12AEE19	Electrical Machines Lab - II
12AEE24	Signals & Systems
12AEC28	Digital Signal Processing
12AEE42	Electrical Machine Design
12AEE44	Special Electrical Machines

<b>Outcome-(E)</b>	
12AEE03	Electro Magnetic Fields
12AEE23	Switch Gear & Protection
12AEE27	Power System Analysis
12AEE29	Power System Operation and Control
12AEE31	HVDC Transmission
12AEE33	EHV AC Transmission
12AEE38	Power Systems and Simulation Lab
12AEE46	Power System Deregulation
12AEE47	High Voltage Engineering
12AEE48	Inter-connected Power Systems
12AEE49	Power System Dynamics & Stability,

<b>Outcome-(F)</b>	
12ACS01	Programming in C and Data Structures
12ACS02	Computer Programming Lab
12AEE22	Soft Computing Techniques
12AEC22	Micro Processors & Micro Controllers
12AEE30	Design of Electrical Systems
12AEC31	Micro Processors & Micro Controllers Lab
12AEE32	Distribution of Electric Power & Smart Grid Technology
12AEE34	Advanced Control Systems
12AEE35	Optimization Techniques
12AEE36	Programmable Logic Controllers
12AEE43	Custom Power Devices Reliability

<b>Outcome (G)</b>	
12AHS09	Environmental Studies
12AHS11	Managerial Economics and Financial Analysis`
12AHS12	Management Science

<b>Outcome (H)</b>	
12AHS01	Technical English
12AHS06	English Language Communication Skills Lab.

<b>Outcome (I)</b>	
12AEE40	Utilization of Electrical Energy
12AEE41	Energy Auditing and Management
12AEE45	Renewable Energy Sources

<b>Outcome (J)</b>	
12AEE26	Seminar
12AEE51	Project

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**I B.Tech**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AHS01 TECHNICAL ENGLISH  
(Common to all Branches)**

**Objectives:**

1. *To train the students to think logically and reasonably*
2. *To train students to use language effectively and to expose the students to a varied blend of self- instructional, learner-friendly modes of language learning.*
3. *To improve the students' proficiency in English at all levels.*
4. *To enhance the confidence of the students by exposing them to various situations and context which they face in their career.*

**Outcomes:**

- After completion of the course the student will be able to*
1. *master in four basic skills (LSRW) to channelize their notions in simple and grammatical English.*
  2. *use English for communication and for performing the technical functions*
  3. *use English as a vehicle to touch the technical sky*
  4. *use logical and reasonable ability while attending written examination and interviews*

**UNIT-I**

Text: **IN LONDON** - by M.K. Gandhi

Non- Detailed: Wings of Fire by Abdul Kalam – lessons 1 to 3

**UNIT-II**

Text: **MAN'S PERIL** by - Bertrand Russell

Non- Detailed: Wings of Fire- lessons 4 to 6

**UNIT-III**

Text: **THE GOLD FRAME** by- R.K. Laxman

Non- Detailed: Wings of Fire- lessons 7 to 9

**UNIT-IV**

Text: **A SERVICE OF LOVE** by - O. Henry

Non- Detailed: Wings of Fire- lessons 10 to 12

**UNIT-V**

Text: **ENVIRONMENT** by – C.V. Raman

Non – Detailed: Wings of Fire –lessons 13 to 15

**UNIT- VI**

Text: **C.V. RAMAN** by – Subhashree Desikan.

Non – Detailed: Wings of Fire –lessons 16 to 18

**UNIT- VII**

Text: **THE MAN WHO WOULD BE KING**- Rudyard kipling

Non-Detailed: wings of fire- lessons 19 to 21

**UNIT- VIII**

Text: **LIVING OR DEAD**- Rabindranath Tagore

Non-Detailed: Wings of Fire –lessons 22 to 24

## REMEDIAL GRAMMAR:

1. Correction of sentences
2. Sub-verb agreement
3. Use of articles and prepositions, active/passive voice and reported speech
4. Vocabulary development
  - a) Synonyms and antonyms
  - b) Prefixes and suffixes
  - c) One word substitutions
  - d) Idioms and phrases
  - e) Words often confused
  - f) Homophones, Homographs and Homonyms

## Text Books:

1. Text: *Technical English*
2. Non Detailed: *Wings of Fire*- Abdul Kalam. APJ. Universities Press, 2004

## References:

1. Ashraf Rizvi M. *Resumes and interviews*, Tata- McGraw Hill, 2009
2. Robert J. Dixon, *Everyday Dialogues in English* by Prentice-Hall of India Ltd., 2006.
3. Andrea J Rutherford -*Basic communication skills for Technology*, Pearson Education, Asia Ltd, 2000.
4. Thomson Martinet- *Practical English Grammar* by, Oxford, 1986.
5. Leech Svartvik, *Communicative Grammar of English*. Longman, 1975.
6. *Swan Practical English Usage*, oxford, 2005.
7. Johnson, *Communication in the class room*, Longman, 1999.
8. Horn A.S. *Oxford Advanced Learners Dictionary*.Oxford, 1948.
9. Bansal R.K, Harrison J B, *Spoken English*, Longman, 1983
10. Balasubramaniam T. *A Text Book of English Phonetics for Indian students*, Macmillan, 2000.
11. MeenakshiRaman Sangeetha Sharma *Technical communication*, Oxford, 2004.
12. Krishna Mohan *Developing Communication Skills*, Macmillan, 2000.
13. Daniel Jones *An Out Line of English Phonetics*, Kalyani Publishers, 1940.
14. Ahuja BN *Dictionary of Synonyms & Antonyms*, Good will Publishers, 2008.
15. Cambridge International of *Phrasal Verbs*, Cambridge, 1997.
16. Martin Hewings *Essential English Grammar* , Cambridge, 2000
17. John Eastwood *Oxford Practice Grammar*, Oxford, 2004.
18. Daniel Jones *English Pronouncing Dictionary* Oxford, 2002

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR  
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**I B.Tech**

**12AHS02 ENGINEERING MATHEMATICS –I**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>6</b>

**(Common to all Branches)**

**Objectives:**

1. *To model and analyze real life problems*
2. *To apply Differential equations, Laplace transforms, Integrals and multiple integrals to Engineering problems.*
3. *To increase the student's appreciation of the basic role played by mathematics in modern technology*

**Outcomes:**

- After completion of the course the student will be able to*
1. *familiar with the applications of differential equations, Laplace transforms, Vector Integrals and Multiple integrals, Curve tracing and vector calculus.*
  2. *appreciate the usage of above concepts to engineering applications.*

**UNIT-I**

**DIFFERENTIAL EQUATION:** Differential equation of first order and first degree-exact, Non –exact, linear and Bernoulis Equations-Applications of first order and degree of Differential equation: Orthogonal Trajectories, Newton’s Law of cooling, Law of Natural Growth and decay.

**UNIT-II**

**NON-HOMOGENOUS AND LINEAR DIFFERENTIAL EQUATION:** Non-homogenous and Linear Differential equation of 2<sup>nd</sup> order and higher order with Constant co-efficient with R.H.S terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{xv(x)}$ ,  $xV(x)$ , Method of variation of parameters.-Variable Coefficients-L-R-C Circuits.

**UNIT-III**

**MEAN VALUE THEOREMS:** Rolle’s theorem-Lagrange’s mean value theorem (without proof)-Taylor’s theorem and Maclaurin’s series-functions of several variables – Jacobian-maxima and Minima for functions of two variables-Lagrangean method of multipliers of 3 variables only.

**UNIT-IV**

**RADIUS OF CURVATURE:** Curve tracing-Cartesian, polar, parametric curves. Applications of Integration: length, Volume and surface area of solid of revolution Cartesian and polar co-ordinates.

## **UNIT-V**

**MULTIPLE INTEGRALS:** Double and Triple integrals-Change of variables-change of Order of integration.

## **UNIT-VI**

**LAPLACE TRANSFORMS-I:** Laplace transforms of standard functions-Inverse Transforms-First –Shifting Theorem-transforms of derivatives and integrals-Unit step Function-2<sup>nd</sup> Shifting Theorem –Dirac delta Functions-.

## **UNIT-VII**

**LAPLACE TRANSFORMS-II:** convolution theorems- Laplace transforms of periodic functions. Differentiation and integration Laplace transforms. Applications of Laplace transform ordinary differential equation of 1<sup>st</sup> and 2<sup>nd</sup> order

## **UNIT-VIII**

**VECTOR CALCULUS:** Gradient, Divergence, curl and their properties. Vector Integration: line Integrals –potential functions-area, surface and volume integrals -Vector Integral theorems: Green’s theorem-Stoke’s theorem& Gauss Divergence theorems (without proof)-Verification of Green’s, Stoke’s and Gauss’s Theorem

### **Text Books:**

1. Iyengar. T.K.V., Krishna Gandhi .B and others, *A Text book of Engineering Mathematics –I*,New Delhi, S.Chand and company,2011.
2. Shankaraiah.C, *A Text book of Engineering Mathematics*, Vijayawada,VGS book links,2007.
3. Rukmangadachari.E and Keshava Reddy, *A Text book of Engineering Mathematics-I*, Pearson Education

### **References:**

1. Dr..Grewal .B.S, *Higher Engineering Mathematics*,New Delhi,Khanna Publishers,2004.
2. Ramana .B.V., *A Text book of Engineering Mathematics*, Tata Mc Graw Hill,2009.
3. Thomson ,*A Text book of Engineering Mathematics*, Book Collection
4. Bail.N, Goyal.M. & Walking.C, *A Text book of Advanced Engineering Mathematics-A computer approach*

**I B.Tech**

**12AHS03 ENGINEERING PHYSICS  
(Common to all branches)**

**Objectives:**

1. To understand the basic concepts of light, crystallography and X-ray diffraction, Quantum mechanics, Lasers and Fiber optics applicable to basic engineering concepts.
2. To understand the importance of semiconductors, superconductors, nano materials, dielectric & magnetic materials in the various engineering fields

**Outcomes:**

*After completion of the course students will be able to*

1. imbibe the knowledge of wave nature of light, crystallography, behavior of electrons in various potential fields, band theory solids, semiconductors & super conductors, magnetic & dielectric materials applicable to material science
2. get Knowledge about the advanced concepts of engineering physics.

**UNIT I**

**OPTICS:** Interference in thin films by reflection – Interference by air wedge method – Newton Rings. Diffraction – Fraunhofer diffraction at single slit – Diffraction grating – Grating spectrum. Polarization – Nicol prism – Theory of circular and elliptical polarized light – Quarter and Half wave plates – Applications.

**UNIT II**

**CRYSTAL STRUCTURES:** Introduction – Space lattice – Basis – Unit cell – Lattice parameter – Crystal systems – Bravais lattices – Structure and packing fractions of Simple cubic, body centered cubic, face centered cubic crystals – structures of Diamond, ZnS, NaCl.

**CRYSTAL PLANES AND X-RAY DIFFRACTION:** Directions and planes in crystals – Miller Indices – Separation between successive [ h k l ] planes – Diffraction of X-rays by crystal planes – Bragg's law – Laue method and powder method.

**UNIT III**

**PRINCIPLES OF QUANTUM MECHANICS:** Wave and particles – Planck's quantum theory – de Broglie hypotheses – Matter waves – Davisson and Germer experiment – Schrödinger time independent wave equation – Physical significance of wave function – Particle in one dimensional box – Quantum free electron theory – Fermi-Dirac distribution & effect of temperature – Electron scattering and resistance - Temperature and compositional dependence with examples – Bloch theorem (statement only) – Kroning Penney model(qualitative treatment only) – Origin of energy band formation in solids – Metals, semiconductors and insulators.

#### **UNIT IV**

**SEMICONDUCTORS:** Introduction – Intrinsic semiconductor and carrier concentration – Extrinsic semiconductor and carrier concentration – Fermi level – Equation of conductivity – Drift and diffusion – Einstein's equation – Hall Effect.

**SUPERCONDUCTORS:** General properties of superconductors – Meissner effect – Penetration depth – Type I and Type II superconductors – Flux quantization – Josephson effect – BCS theory – Application of superconductors – SQUID Electronics.

#### **UNIT V**

**NANOMATERIALS:** Introduction – Basic properties of nanomaterials – Fabrication of nanomaterials: Ball milling, Spray pyrolysis, Plasma arching, Chemical vapor deposition, Sol-Gel method – Carbon Nano Tubes – Application of nanomaterials and carbon nano tubes .

#### **UNIT VI**

**DIELECTRIC PROPERTIES:** Introduction – Dielectric constant – Electronic, Ionic and Oriental polarizations – Internal fields – Clausius-Mossotti equation – Frequency dependence of the polarizability – Ferro and Piezo electricity.

**MAGNETIC PROPERTIES:** Introduction – Origin of magnetic moment – Classification of magnetic materials – Dia, Para, Ferro, antiferro and ferri magnetism – Hysteresis curve – Soft and Hard magnetic materials and their applications.

#### **UNIT VII**

**LASERS:** Introduction – Characteristics of lasers – Spontaneous and stimulated emission of radiation – Einstein's coefficients – population inversion – Ruby laser – He-Ne laser – Semiconductor laser – Applications of laser.

#### **UNIT VIII**

**FIBER OPTICS :** Introduction – Principle of optical fiber – Acceptance angle and acceptance cone – Numerical aperture – Step-Index fiber and transmission of signal in SI fiber – Graded-Index fiber and transmission of signal in GI fiber – Attenuation in optical fibers – Optical fibers in communication system – Advantages of optical fibers in communication – Optical fiber communication system. Application of optical fibers in medicine and sensors.

**Text Books:**

1. Dr. Mani Naidu.S: Engineering Physics, 1<sup>st</sup> Edition, Pearson Publishing House, 2012.
2. Rajendran and Thyagarajan: Engineering Physics, Delhi, TMH Publishers, 2011
3. Palanisamy .p. k: Engineering Physics, Hyderabad, Scitech Publications, 2009
4. Gaur and Gupta: Engineering Physics, New Delhi, Dhanpat Rai Publishers, 2003

**Reference Books:**

1. Pillai.S.O: Solid State Physics, 6<sup>th</sup> edition,New Delhi: New Age International, 2005.
2. Kittel.C: Introduction to Solid State Physics,7<sup>th</sup> edition, New Delhi: Wiley publishers, 2008.
3. Chattopadhyay,k.k, Banerje,A.N: Introduction to Nano Science and Technology,New Delhi: PHI,2009 .
4. Resnick, Halliday and Walker: Fundamentals of Physics, 6<sup>th</sup> Edition, New Delhi: Wiley Publishers, 2001.
5. Pradeep, T: Nano, The essentials, TMH, 2008.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY, CHITTOOR  
(AUTONOMOUS)**

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**I B.Tech**

**12AHS04 ENGINEERING CHEMISTRY  
(Common to all branches)**

**Objectives:**

1. *To understand importance of Hard water treatments, corrosion factors, polymer properties, fuels-calorific values, lubricants, explosives and propellants.*
2. *basic concept of Batteries function, nano materials, composite materials, principles of absorption and emission of radiations.*

**Outcomes:**

*After Completion of the course student will be able to*

1. *understand the disadvantages of hard water, designing of corrosion resistance metallic part, selection of suitable polymers and fuels, handling of explosives and propellants.*
2. *understand the difference between batteries and fuel cells, application of nano materials and composite materials, estimation of metal ion concentration.*

**UNIT- I**

**WATER TECHNOLOGY:** Sources of Water - Types of impurities in Water - Hardness of Water – Temporary and Permanent hardness-Units of hardness - Disadvantages of Hard Water - Estimation of hardness by EDTA titration methods - Numerical Problems on calculation of hardness of water; Dissolved Oxygen . Methods of Treatment of Water for Domestic purposes – Treatment of Water for Industrial purpose – Characteristics of Water for Steam generation, Boiler Troubles – Boiler Corrosion - Carry Over (Priming and Foaming), Scales and Sludges, Caustic Embrittlement. Internal conditioning methods – Colloidal, Phosphate, Calgon, Carbonate, Sodium aluminates Conditioning of Water. Water softening methods: Zeolite process – Ion- Exchange Process - Demineralization of Brackish Water – Electro dialysis and Reverse Osmosis.

**UNIT – II**

**CORROSION ENGINEERING:** Definition, Types (dry and wet corrosion) and causes of corrosion – Theories and mechanism of corrosion - Galvanic Series, Galvanic Corrosion, Concentration Cell Corrosion, Oxygen absorption type of corrosion - Factors influencing corrosion. Control of Corrosion – Cathodic Protection – Sacrificial anodic and Impressed Current cathodic protection – Corrosion Inhibitors - Electro Plating and Electro less plating (Principles and applications with copper and nickel plating as examples).

**UNIT – III**

**HIGH POLYMERS:** Classification of polymers – Mechanism of polymerization – addition and condensation. Plastics –Thermosetting and Thermoplastics. Preparation, Properties and Engineering applications of PE, PTFE, PVC, Nylon, Bakelite ; Rubber - Processing of Natural Rubber- Vulcanization - Compounding of rubber – Synthetic rubber - Buna S, Buna N, Polyurethane Rubber, Silicone Rubber. Moulding of plastics into articles - Compression, Injection, transfer and extrusion methods. Conducting Polymers- Classification - Properties and applications of conductive polymers –Methods of degradation of polymers - Biodegradable polymers.

#### **UNIT- IV**

**FUELS AND COMBUSTION:** Fuels – Definition and Classification of fuels - Calorific value - LCV, HCV, measurement of calorific value using Bomb calorimeter and Junkers gas calorimeter (numerical problems) – characteristics of a good fuel. Solid fuels: Metallurgical Coke – Characteristics & Manufacture (Otto-Half Mann method) Liquid Fuels: Source of petroleum – fractionation -Gaseous fuels: LPG, natural gas, CNG - composition and applications. Biofuels: Biodiesel and Biogas – Composition and applications. Combustion: Definition and Calculation of air quantities (numerical problems), Flue gases and their analysis by Orsat's apparatus.

#### **UNIT- V**

**LUBRICANTS, EXPLOSIVES AND PROPELLANTS:** Lubricants: Function of lubricant – Classification - liquid, semi solid and solid - mechanism of different types of lubrication - properties: Viscosity, Flash and fire points, Aniline point, and Mechanical strength – Selection of lubricants. Explosives and Propellants: Classification of explosives – Blasting fuses – Important explosives – Uses of explosives. Monopropellants and bipropellants – Classification of Rocket propellants - Examples, composition and applications.

#### **UNIT- VI**

**ELECTROCHEMICAL ENERGY SYSTEMS:** Electrochemical Cells: Measurement of EMF, Standard electrode potential, concentration cells; Basic concepts, working principles, characteristics and applications of different electrochemical energy systems - Conventional Primary battery - Dry cell; Advanced Primary batteries - Lithium and alkaline; Conventional secondary batteries: Lead-acid, Nickel-Cadmium; Advanced secondary batteries: Nickel-Metal hydride and Lithium-ion. Fuel cells: Hydrogen-oxygen and methanol-oxygen construction, working and applications.

#### **UNIT- VII**

**MATERIALS CHEMISTRY:** Composite materials: Constituents of composites – Types of composites- Fibre reinforced, metal matrix, ceramic – properties and specific applications. Nanomaterials: classification, properties and applications  
General methods of preparation of nanomaterials – combustion and sol-gel processes of preparation of Silver, Zinc oxide and Ruby nanoparticles

#### **UNIT- VIII**

**INSTRUMENTAL METHODS OF ANALYSIS:** Electromagnetic spectrum: EMR interaction with matter - absorption and emission of radiation. Colorimetry and Spectrophotometry - UV- visible – Principle – Beer-Lambert's law- Instrumentation of colorimeter, single beam and double beam spectrophotometer – Quantitative applications of colorimetric analysis – estimation of concentration of a typical metal ion (Iron – 1,10 - phenonthroline complex).

#### **TEXT BOOKS:**

1. Jain & Jain. *Text book of Engineering Chemistry*. 15<sup>th</sup> edition. New Delhi: Dhanpat Rai Publishing Company, 2008.
2. *A text book of Engineering Chemistry* by S.S. Dara, S.Chand & Co, New Delhi (2008)
3. Prof. Jayaveera, K.N , Dr. Subba Reddy, G.V and Dr. Ramachandraiah, C. *Engineering Chemistry*. Hyd: McGraw Hill Higher Education , 2009
4. Mamata V. Sachdeva. *Basics of Nanochemistry*. New Delhi: Anmol Publications Pvt. Ltd, 2011
5. Gurudeep and chatwaal. *Instrumental methods of analysis*. Mumbai: Himalaya Publishing House, 1979

## REFERENCE BOOKS:

1. Dr.Chandrasekhar.K.B, Dr.Dash.U.N and Dr.Sujatha Mishra. *Engineering Chemistry*. Hyderabad: Scitech Publications Pvt. Limited, 2009
2. *Fuel Cells principle and applications* by B.Viswanath, M.Aulice Scibioh-Universities press
3. Agarwal.C.V.Chemistry of *Engineering Materials*. Varanasi:Tara Publication, 2008
4. *Physical Chemistry*-Glasston & Lewis.
5. Kuriacose.J.C and Rajaram.J *Engineering Chemistry* (Vol.1&2). New Delhi: Tata McGraw-Hill , 2004
6. *Applied chemistry: A Text Book for Chemistry for Engineers & Technologists*, G.D.Gesser, Springer,2000
7. Muralidharan.V.S and A.Subramania. *Nano Science and technology*.New Delhi:Aue Books Pvt. Ltd 2009

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**I B.Tech**

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**(12ACS01) PROGRAMMING IN C AND DATA STRUCTURES  
(Common to all branches)**

**Objectives:**

1. Learn how these principles are implemented in the C programming language.
2. Develop problem-solving skills to translate 'English' described problems into programs written using the C language.
3. An understanding of the function and operation of development software such as the compiler, interpreter, editor, IDE (Integrated Development Environment), and debugger.

**Outcomes:**

After completion of this course students will be able to:

1. Solve engineering problems using the C language
2. Students are expected to improve their programming skills.
3. Students are expected to apply the knowledge gained for their project work.

**UNIT I**

Introduction – The Problem Solving aspect – Top down Design – Implementation of Algorithms – Program Verification – Efficiency of Algorithms – Analysis of Algorithms

**UNIT II**

Introduction to C Language – Background, Simple C Program, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples. Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

**UNIT III**

Designing Structured Programmes, Functions, basics, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programmes Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C programme examples.

**UNIT IV**

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments. Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C programme examples.

**UNIT V**

Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

## **UNIT VI**

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C programme examples.

## **UNIT VII**

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods, Trees: representation, tree traversals.

## **UNIT VIII**

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations.

### **TEXT BOOKS:**

1. B.A.Forouzan and R.F. Gilberg: *C Programming & Data Structures*, Third Edition, Cengage Learning.
2. J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao: *Programming in C and Data Structures*, Pearson Education.
3. R.G.Dromey: "*How to Solve it by Computer*", PHI , 1998

### **REFERENCES:**

1. P. Padmanabham: *C& Data structures*, Third Edition, B.S. Publications.
2. B.W. Kernighan and Dennis M.Ritchie: *The C Programming Language*, PHI/Pearson Education
3. J.A. Jones & K. Harrow: *C Programming with problem solving*, dreamtech Press
4. Stephen G. Kochan: *Programming in C*, III Edition, Pearson Eductaion.
5. H.Cheng: *C for Engineers and Scientists*, Mc.Graw-Hill International Edition
6. A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein: *Data Structures using C*, Pearson Education / PHI
7. P. Dey, M Ghosh R Thereja: *C Programming & Data Structures*, Oxford University Press
8. E V Prasad and N B Venkateswarlu: *C& Data structures*, S. Chand&Co.

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**I B.Tech**

**(12AEE01) ELECTRICAL CIRCUITS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>6</b>

**Objectives:**

1. To understand the nature of different circuit elements, fundamental laws and network theorems, Electrical Circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline
2. To understand about phasor concepts of single phase and three phase circuits and Magnetic circuits.
3. To study transient behavior and Steady state analysis of circuits, network topology and analysis of two-port networks.

**Outcomes:**

After completion of this course, the student will be able to:

1. Apply circuit analysis techniques in study of other courses like electronic circuits, design of electrical machines and power systems analysis.
2. To apply the circuit concepts in modeling of any physical system for steady state analysis.

**UNIT I**

**INTRODUCTION TO ELECTRICAL CIRCUITS:** Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements – Kirchhoff's laws – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation-Node and Mesh analysis-concept of super node and super mesh for DC Circuits.

**UNIT II**

**MAGNETIC CIRCUITS:** Magnetic Circuits – Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit - Analysis of series and parallel magnetic circuits.

**UNIT III**

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

**UNIT IV**

**LOCUS DIAGRAMS AND RESONANCE:** Locus diagrams – series R-L, R-C, R-L-C and parallel combination with variation of various parameters – Resonance – series, parallel circuits, concept of band width and Q factor.

**UNIT V**

**THREE PHASE CIRCUITS:** Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – Measurement of and reactive power.

**UNIT VI**

**NETWORK THEOREMS (WITHOUT PROOFS):** Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's, Tellegen's, and Compensation theorems for D.C. and a.c. excitations.

## **UNIT VII**

**TRANSIENT ANALYSIS:** Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform methods of solutions. Response of RL,RC and RLC for step and pulse excitation using Laplace Transformation.

## **UNIT VIII**

**NETWORK ANALYSIS NETWORK TOPOLOGY:** Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with independent voltage and current sources - Duality & Dual networks.

**TWO PORT NETWORK PARAMETERS:** Two port network parameters – Z, Y, (ABCD) transmission and hybrid parameters and their relations– Conditions for symmetry and Reciprocity

### **TEXT BOOKS:**

1. William Hayt and Jack E. Kimmerly: *Engineering circuit analysis*, Mc Graw Hill Company, 6<sup>th</sup>edition.
2. Alexander and sadiku: *Fundamentals of Electric circuits*, Mc-graw Hill

### **REFERENCE BOOKS:**

1. Vanvalkenburg: '*Network Analysis*', PHI.
2. S.Sudhakar, P.S.M.Satyanarayana: '*Electrical Circuits*', TMH Publication.
3. Nahvi and Edminister: *Electric circuits*, Schaum's outline series, Tata Mc-graw Hill

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**I B.Tech**

**12AME01      ENGINEERING DRAWING  
(Common to all branches)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**Objectives:**

1. To enhance imagination capacity
2. To understand the importance of Engg Drawing
3. To Use Engg Drawing instruments and wrote free hand Lettering.
4. To Understand dimensioning practice
5. To Apply principles of artho graphic projections.
6. To Under the need for auxillary views and sectional views
7. To Prepare pictorial drawings.

**Outcomes:**

After completion of this course, the student will be able to:

1. Maste the Prepare pictorial drawings as per the international standards
2. Prepare drawings as per the international standards.
3. Communicate his/het ideas globally effectively by using the principles of orthographic projections.
4. Prepare the development of surfaces of simple engineering objects.

**UNIT I**

**INTRODUCTION TO ENGINEERING DRAWING:** Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice – scales.

- a) Conic Sections – General method only.
- b) Scales – plain and diagonal scales

**UNIT II**

**PROJECTION OF POINTS AND LINES:** Principles of Orthographic Projection – Conventions – First Angle Projections. Projections of Points, Lines inclined to one and both planes, Problems on projections, Finding True lengths & True inclinations.

**UNIT III**

**PROJECTIONS OF PLANES:** Projections of regular Plane surfaces, Projection of lines and planes using auxiliary planes.

**UNIT IV**

**PROJECTIONS OF SOLIDS:** Projections of Regular Solids inclined to one plane.

**UNIT V**

**SECTIONS AND DEVELOPMENTS OF SOLIDS:** Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid and Cone.

**UNIT VI**

**ISOMETRIC PROJECTIONS:** Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple Solids – Isometric Projection of objects having non- isometric lines. Isometric projections of spherical parts. Conversion of Isometric projections/views to Orthographic Views and vice versa

**UNIT VII**

**INTERPENETRATION OF RIGHT REGULAR SOLIDS:** Projections of curves of Intersection of Cylinder Vs Cylinder, Square Prism Vs Square Prism.

**UNIT VIII**

**PERSPECTIVE PROJECTIONS:** perspective view, plane and simple solids.

**TEXT BOOKS:**

1. K.L. Narayana, P. Khannah: *Engineering Drawing*, Scitech Publishers
2. N.D. Bhat: *Engineering Drawing*, Charotar Publishers

**REFERENCES:**

1. Johle: *Engineering Drawing*, Tata McGraw-Hill
2. Shah and Rana: *Engineering Drawing*, 2<sup>nd</sup> Edition, Pearson Education

**I B.Tech**

**12AHS05 ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB  
(Common to all Branches)**

**ENGINEERING PHYSICS LAB:**

A minimum of 10 experiments to be conducted during the academic year

1. Determination of wavelength of given light source - Spectrometer.
2. Dispersive power of prism
3. Determination of wavelength of laser – Diffraction grating.
4. Determination of particle size by using laser
5. Determination of thickness of thin wire by producing parallel fringes.
6. Newton Rings.
7. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
8. Numerical Aperture of an optical fiber.
9. Bending losses in Optical Fiber.
10. Determination of wavelength of IR source using optical fiber.
11. Determination of Hall Coefficient and Carrier concentration in the given Semiconductor.
12. B-H curve.
13. Energy gap of a semiconductor.
14. Determination of Dielectric constant.

**ENGINEERING CHEMISTRY LAB:**

1. Preparation of Standard Potassium Dichromate solution and Estimation of Ferrous Ion.
2. Estimation of Copper by Iodometry.
3. Estimation of Hardness of Water by EDTA method.
4. Estimation of Copper by EDTA method
5. Determination of Chemical Oxygen Demand
6. Estimation of Dissolved oxygen
7. Determination of strength of the given Hydrochloric acid using standard sodium hydroxide solution by Conductometric titration
8. Determination of viscosity of oils through Redwood viscometer
9. Determination of calorific value of a fuel using Bomb calorimeter
10. Determination of Eutectic Temperature of binary system (Urea – Benzoic Acid)

**EXAMINATION PATTERN**

Evaluation is made separately in both the laboratories and average of the marks obtained in both the laboratories is considered for awarding marks in internals and end examination.

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**I B.Tech**

**(12ACS02) COMPUTER PROGRAMMING LAB  
(Common to all Branches)**

**Objectives:**

1. To make the student learn a programming language.
2. To teach the student to write programs in C solve the problems
3. To Introduce the student to simple linear and non linear data structures

**Outcomes:**

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

1. Design a program related to challenging questions.
2. Apply the knowledge gained for their project work.
3. Understand the concepts of pointers, linear and non linear data structures.

**Week 1**

- a) Write a C program to find the sum of individual digits of a positive integer.
- b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Week 2**

- a) Write a C program to calculate the following Sum:  
 $Sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
- b) Write a C program to find the roots of a quadratic equation.

**Week 3**

- a) Write C programs that use both recursive and non-recursive functions
  - i) To find the factorial of a given integer.
  - ii) To find the GCD (greatest common divisor) of two given integers.
  - iii) To solve Towers of Hanoi problem.

**Week 4**

- a) The total distance travelled by vehicle in 't' seconds is given by distance =  $ut + \frac{1}{2}at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
- b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

**Week 5**

- a) Write a C program to find both the largest and smallest number in a list of integers.
- b) Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

**Week 6**

- a) Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.

- ii) To delete n Characters from a given position in a given string.  
b) Write a C program to determine if the given string is a palindrome or not

### **Week 7**

- a) Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.  
b) Write a C program to count the lines, words and characters in a given text.

### **Week 8**

- a) Write a C program to generate Pascal's triangle.  
b) Write a C program to construct a pyramid of numbers.

### **Week 9**

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$$1+x+x^2+x^3+\dots+x^n$$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum Perform error checking. For example, the formula does not make sense for negative exponents - if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.

### **Week 10**

- a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.  
b) Write a C program to convert a Roman numeral to its decimal equivalent.

### **Week 11**

Write a C program that uses functions to perform the following operations:

- i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers
- (Note: represent complex number using a structure.)

### **Week 12**

- a) Write a C program which copies one file to another.  
b) Write a C program to reverse the first n characters in a file.  
(Note: The file name and n are specified on the command line.)

### **Week 13**

- a) Write a C programme to display the contents of a file.  
b) Write a C programme to merge two files into a third file ( i.e., the contents of the first file followed by those of the second are put in the third file)

### **Week 14**

Write a C program that uses functions to perform the following operations on singly linked list.:

- i) Creation ii) Insertion iii) Deletion iv) Traversal

### **Week 15**

Write C programs that implement stack (its operations) using

- i) Arrays ii) Pointers

**Week 16**

Write C programs that implement Queue (its operations) using

- i) Arrays ii) Pointers

**Week 17**

Write a C program that uses Stack operations to perform the following:

- i) Converting infix expression into postfix expression
- ii) Evaluating the postfix expression

**Week 18**

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- i) Bubble sort
- ii) Selection sort

**Week 19**

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :

- i) Linear search ii) Binary search

**Week 20**

Write C program that implements the following sorting method to sort a given list of integers in ascending order:

- i) Quick sort

**Week 21**

Write C program that implement the following sorting method to sort a given list of integers in ascending order:

- i) Merge sort

**Week 22**

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

**Week 23**

Write C programs to implement the linear regression and polynomial regression algorithms.

**Week 24**

Write C programs to implement Trapezoidal and Simpson methods.

**TEXT BOOKS:**

1. Padmanabham.P: *C programming and Data Structures*, Third Edition, BS Publications
2. Venugopal.K.R and S.R. Prasad: *Mastering C*, TMH Publications.
3. Cooper.M: *The Spirit of C, an introduction to modern programming*, Jaico Publishing House.
4. Steve Oualline, O'Reilly,SPD: *Practical C Programming*, TMH publications.
5. Rajaraman.V: *Computer Basics and C Programming*, PHI Publications.
6. Kruse.C,R, Tondo.C.L, Leung, M.Shashi B.P: *Data structures and Program Design* Pearson Education.

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**I B.Tech**

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**12AME02 ENGINEERING & IT WORKSHOP  
(Common to all branches)**

**Objectives:**

1. *The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc.*
2. *There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials.*
3. *Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.*
4. *Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 gauge G.I. sheet
- d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint

**2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

**REFERENCE BOOKS:**

1. Kannaiah.P, Narayana.K.L: *Work shop Manual*, SciTech Publishers.
2. Jeyapoovan, Saravana Pandian: *Engineering Practices Lab Manual*, 4<sup>th</sup> Edition , Vikas
3. GHF Nayler, Jaico: *Dictionary of Mechanical Engineering*, Publishing House.

## I.T. WORKSHOP

### Objectives:

1. *The IT Workshop for engineers is a training lab course.*
2. *The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.*

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

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

**Productivity tools** module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX. (It is recommended to use Microsoft office 2007 in place of MS Office 2003)

### PC Hardware

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

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

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

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

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

**Exercise 6 – Task 6: Software Troubleshooting:** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

### OFFICE TOOLS

#### LaTeX and Word

**Exercise 7 – Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 1 : Using LaTeX and Word** to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

### **Excel**

**Exercise 8 - Excel Orientation:** The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

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

### **LaTeX and MS/equivalent (FOSS) tool Power Point**

**Exercise 9 - Task1:** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

**Exercise 10 - Task 2 :** Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

### **Internet & World Wide Web**

**Exercise 11 - Task 1: Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Web Browsers, Surfing the Web:** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

**Exercise 12 - Task 2: Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of instructors.

**Cyber Hygiene:** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer.

### **REFERENCE BOOKS:**

1. *Introduction to Information Technology*, ITL Education Solutions limited, Pearson Education.
2. Leslie Lamport: *LaTeX Companion*, PHI/Pearson.
3. Peter Norton: *Introduction to Computers*, 6<sup>th</sup> Edition, Mc Graw Hill
4. Scott Muller QUE: *PC's Upgrading and Repairing*, 18<sup>th</sup> Edition, Pearson Education
5. WILEY Dreamtech: *Comdex Information Technology course tool kit*, Vikas Gupta,
6. David Anfinson and Ken Quamme: *IT Essentials PC Hardware and Software Companion Guide*, Third Edition, CISCO Press, Pearson Education.

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**I B.Tech**

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**12AHS06 ENGLISH LANGUAGE COMMUNICATIONS SKILLS LAB  
(Common to all Branches)**

**Syllabus:**

The following course content is prescribed for the **English Language Laboratory Sessions.**

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues (giving directions etc.)
4. Speaking on the mobiles and telephone conversation
5. Role play.
6. Oral Presentations-Prepared and Extempore.
7. 'Just A Minute' Sessions (JAM)
8. Describing Objects/ Situations/ People.
9. Information Transfer
10. Debate.

**MINIMUM REQUIREMENT:**

**The English Language Lab shall have two parts:**

1. **The computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.
2. **The communication Skills Lab** with movable chairs and audio-visual aids with P.A system, a T.V., a digital stereo- audio & video system and camcorder etc.

**System Requirement (Hardware component):**

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P-IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality.

**PRESCRIBED SOFTWARE: GLOBARENA**

**Suggested Software:**

- Cambridge Advanced Learners English Dictionary with CD.
- The Rosetta stone English Library.
- Clarity Pronunciation Power- Part I
- Mastering English in Vocabulary, Grammar, Spellings, and Composition.
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD
- Learning to Speak English – 4 CDs
- Microsoft Encarta with CD
- Murphy's English Grammar, Cambridge with CD
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.

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**II B.Tech –I Semester**

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**12AHS07 ENGINEERING MATHEMATICS-II  
(Common to all Branches)**

**Objectives:**

1. To develop the basic concepts of Matrices, interpolation, partial differential equations and finite series.
2. To appreciate the applications of PDE to engineering problems.

**Outcomes:**

*After completion of the course the student will be able to*

1. conversant with the basics of matrices, PDEs, finite series etc.
2. model and solve different engineering problems with the above concepts.

**UNIT-I**

**MATRICES:** Rank of a matrix- Echelon form, Normal form - solution of linear system of homogeneous and non - homogeneous equations-direct methods - Gauss elimination, Gauss -Jordan methods.

**UNIT-II**

**EIGEN VALUES AND EIGEN VECTORS:** Eigen values and Eigen vectors - Inverse and powers of a matrix by Cayley-Hamilton theorem - Linear Transformations - Orthogonal transformations -Diagonalization of a matrix. Quadratic forms - Reduction of Quadratic form to canonical form and their nature.

**UNIT-III**

**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:** Introduction - The Bisection method - The method of false position - The Iteration method - Newtons-Raphson method

**INTERPOLATION:** Forward Differences - backward differences - Newton's forward and backward differences formulae for interpolation - Lagrange's interpolation formula - Inverse interpolation .

**UNIT-IV**

**CURVE FITTING:** Fitting a straight line - Second degree curve - Exponential curve - Power curve by method of least squares. Numerical Differentiation and integration - Trapezoidal rule - Simpson's 1/3 rule.

## **UNIT-V**

**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS:** solution by Taylor's series-Picard's method of successive Approximations - Euler's Method - Runge-Kutta Methods -Predictor-corrector method - Milne's method.

## **UNIT-VI**

**FOURIER SERIES:** Determination of Fourier Coefficients - Even and odd functions - Fourier series in an arbitrary interval - periodic continuous functions - Half-range Fourier sine and cosine expansions. Fourier integral theorem (statement) - Fourier sine and cosine integrals. Fourier Transforms - Fourier sine and cosine Transforms - Inverse transforms-Finite Fourier transforms.

## **UNIT-VII**

**PARTIAL DIFFERENTIAL EQUATIONS:** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Method of separation of variables - solution of one dimensional wave equation, heat equation and two - dimensional Laplace's equation under initial boundary conditions.

## **UNIT-VIII**

**Z-TRANSFORMS:** Inverse Z - transforms-Properties-Damping rule-Shifting rule - Initial and final value theorems - Convolution theorem - Solution of difference equations by Z-transforms.

### **Text Books:**

1. Iyengar T.K.V., Krishna Gandhi.B and others, Mathematical Methods, New Delhi, S.Chand & company,2012.
2. Sankar rao G.,Kesav Reddy.E, Mathematical Methods, International publishing house,Pvt.ltd
3. Ranganatham.S,Prasad M.S.S.N.,Ramesh Babu.V, Numerical Analysis, S.Chand & company
4. Sankaraiah .C, Mathematical Methods, Vijayawada,V.G.S Book links,2007.

### **References:**

1. Jain.M.K, IyengarT.K.V,,Jain.R.K. Numerical Methods for Scientific and Engineering Computation. Newage International publishers.
2. Pal, Mathematical Methods ,Oxford University Press,2009.
3. Sastry .S.S., Introduction to Numerical analysis.New Delhi,Prentice Hall of India,2003
4. Erwin Kreyszig ,Advanced Engineering Mathematics. John Wiley & Sons.
5. Dr..Grewal .B.S, Higher Engineering Mathematics,New Delhi,Khanna Publishers,2004

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**II B.Tech –I Semester EEE**

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**12AEE03 ELECTROMAGNETIC FIELDS**

**Objectives:**

1. To introduce the concepts of electric and magnetic fields and their applications.
2. To utilize the development of the field theory for power transmission lines and electrical machines.
3. To impart knowledge about all electromagnetic field laws which are used in electro-statics and magneto statics.

**Outcomes:**

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

1. Apply basic circuit techniques in electromagnetic static fields in power transmission lines.
2. Design all electrical parameters which are related to magnetic potential and time variant fields.
3. Comprehend Mathematical conceptions with physical systems.

**UNIT I**

**ELECTROSTATICS:** Electrostatics Fields - Coulomb's Law - Electric field intensity(EFI) - EFI due to a line and a surface charge - work done in moving a point charge in an electrostatic - electric potential - properties of potential function - potential gradient - Gauss's Law - Application of Gauss's Law - Maxwell's first equation.

**UNIT II**

**CONDUCTORS AND DIPOLE:** Laplace's and Poisson's equations - Solution of Laplace's equation in one variable electric dipole - Dipole moment - potential and EFI due to an electric dipole - Torque of an Electric dipole in an electric field - Behavior of conductors in an electric field - Conductors and insulators.

**UNIT III**

**DIELECTRIC & CAPACITANCE:** Electric field inside a dielectric material - Polarization - Dielectric - Conductor and Dielectric - Dielectric boundary conditions - Capacitance - Capacitance of parallel plate and spherical - co-axial capacitors with composite dielectric - Energy stored and energy density in a static electric field - Current density - Conduction and convection current densities - Ohm's law in point form - Equation of continuity.

**UNIT IV**

**MAGNETO STATICS:** Static magnetic fields - Biot-Savart's law- Oesterd's experiment - Magnetic field intensity (MFI) - MFI due to a straight current carrying filament - MFI due to circular square and solenoid current carrying wire - Relation between magnetic flux, magnetic flux density and MFI - Maxwell's second Equation.

**UNIT V**

**AMPERE'S CIRCUITAL LAW AND ITS APPLICATIONS:** Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament - Point form of Ampere's circuital law - Maxwell's third equation - Fields due to a circular loop - rectangle and square loops.

**UNIT VI**

**FORCE IN MAGNETIC FIELDS:** Magnetic force - Moving charges in a Magnetic field - Lorentz force equation - Force on a current element in a magnetic field - Force on straight and long current carrying conductor in a magnetic field - Force between two straight long and parallel current carrying conductors - Magnetic dipole and dipole

moment – Differential current loop as a magnetic dipole - Torque on a current loop placed in a magnetic field.

#### **UNIT VII**

**MAGNETIC POTENTIAL:** Scalar Magnetic potential and its limitations - Vector magnetic potential and its properties – Vector magnetic potential due to simple configurations - Vector Poisson's equations.

Self and Mutual inductance - Neumann's formulae - Determination of self - Inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane - Energy stored and density in a magnetic field - Introduction to permanent magnets and their characteristics and applications.

#### **UNIT VIII**

**TIME VARYING FIELDS:** Faraday's laws of Electromagnetic Induction and its integral and point forms - Maxwell's fourth equation - Statically and dynamically induced EMFs - Simple problems - Modification of Maxwell's equations for time varying fields - Displacement current - Poynting Theorem and Poynting vector.

#### **TEXT BOOKS**

1. Sadiku: "*Elements of Electromagnetics*", 4<sup>th</sup> edition, Oxford Publications.
1. William H.Hayt & John.A Buck: "*Engineering Electromagnetics*", 7<sup>th</sup> Edition, McGraw Hill companies, 2006.
2. Gangadhar.K.A: "*Field Theory*", 13<sup>th</sup> edition, Khanna Publishers
4. Kraus.J.D: "*Electromagnetics*", 4<sup>th</sup> edition, Mc Graw-Hill inc, 1992.

#### **REFERENCE BOOKS:**

1. Kamakshaiah.S: "*Electromagnetic fields*", Right publishers, 2007
2. Ashutosh Pramanik: "*Electromagnetics-Theory & Applications*", 2<sup>nd</sup> Edition, PHI
3. Ashutosh Pramanik: "*Electromagnetics-Problems with solutions*", 2<sup>nd</sup> Edition, PHI

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**12ACE08 FLUID MECHANICS AND HYDRALIC MACHINERY**

**Objectives:**

1. *The aim of this course is to introduce and explain basic fundamentals of Fluid Mechanics, which is used in various applications of Engineering. Also to learn fluid properties and hydrostatic law – to understand the importance of flow measurement and its applications in Industries and to obtain the loss of flow in a flow system.*
2. *To understand the working principles of hydraulic machinery*

**Outcomes:**

*After completion of this course the student will be able to:*

1. *Find frictional losses in a pipe when there is a flow between two places.*
2. *Identify the pump required for different purposes*
3. *Classify the turbines and explain design criteria based on water availability*

**UNIT I**

**FLUID PROPERTIES:** Dimensions and units - Definition of a fluid – Physical properties of fluids Density – Specific weight – Specific volume – Specific gravity – Compressibility – Vapour pressure – Surface tension and capillarity –Viscosity.

**FLUID STATICS:** Pascal’s law – Pressure variation in a static fluid – Atmospheric, gauge and absolute pressures – Measurement of pressure – Piezometer – U–tube and inverted U–tube manometers – Bourdon’s pressure gauge – Hydrostatic forces on plane and curved surfaces– Center of pressure.

**UNIT II**

**FLUID KINEMATICS:** Types of flow – Streamline – Streak line – Path line – Stream tube – Continuity equation in one and three dimensional forms – Stream function and velocity potential function – Flow net.

**FLUID DYNAMICS:** Euler’s equation of motion along a streamline – Bernoulli’s energy equation – Energy correction factor – Impulse–momentum equation – Momentum correction factor – Force on a bend – Energy gradient line – Hydraulic gradient line.

**UNIT III**

**PIPE FLOW:** Reynolds’ experiment – Reynolds’ number - Minor losses in pipe flow - Darcy–Weisbach equation – Variation of friction Factor – Moody’s chart – Pipes in series – Pipes in parallel.

**FLOW MEASUREMENT:** Velocity measurement by Pitot tube and Pitot static tube – Discharge measurement by Venturimeter and orifice meter – Turbine Flow meter.

**UNIT IV**

**BASICS OF FLUID MACHINERY:** Impact of free jets – Force exerted by fluid jet on stationary and moving plates – Flat, inclined and curved vanes – Velocity triangles at inlet and outlet of the vane – Angular momentum equation – Evaluation of torque exerted on a wheel with curved vanes.

**UNIT V**

**HYDROELECTRIC POWER STATIONS:** Elements of hydro Electric Power station- types- concept of pumped storage plants – storage requirements- mass curve (explanation only) – estimation of power developed from a given catchment area- heads and efficiencies.

## **UNIT VI**

**HYDRAULIC TURBINES I:** Elements of hydroelectric power plants – Heads and efficiencies of turbines – Classification of turbines – Pelton wheel – Main components and working principle – Expressions for work done and efficiency – Working proportions and design.

**HYDRAULIC TURBINES II:** Radial flow reaction turbines – Modern Francis turbine – Work done and efficiency – Working proportions and design – Draft tube theory – Kaplan turbine – Working proportions – Governing of turbines – Runaway speed.

## **UNIT VII**

**PERFORMANCE OF TURBINES:** Performance under unit head – Unit quantities – Performance under specific conditions – Specific speed – Expressions for specific speed – Performance characteristic curves – Model testing of turbines – Cavitation in turbines – Selection of turbines.

## **UNIT VIII**

**CENTRIFUGAL PUMPS–I:** Advantages of centrifugal pumps over reciprocating pumps – Classification and types of pumps – Components and working of a centrifugal pump – Work done by the impeller– Heads and efficiencies – Net positive suction head(NPSH)

**CENTRIFUGAL PUMPS–II:** Priming – Priming devices – Minimum starting speed – Multistage pumps – Pumps in series and parallel – Submersible pumps – Limiting suction head – Cavitation – Expression for specific speed – Model testing – Performance characteristics.

## **TEXT BOOKS:**

1. Modi.P.N & Seth.S.M: *Hydraulics and Fluid Mechanics including Hydraulic Machines*, Standard Book House, New Delhi.
2. Bansal.R.K: *A text book of Fluid Mechanics and Hydraulic Machinery*, Laxmi Publications (P) Ltd.

## **REFERENCE BOOKS:**

1. Jagadish Lal: *Hydraulic Machines*, Metropolitan Book Company Pvt. Ltd.
2. Nachleba: *Hydraulic Turbines*, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi
3. Streeter & Wylie: *Fluid Mechanics*, Mc Graw Hills Publications.
4. C.M. White: *Fluid Mechanics*, Mc Graw Hills Publications.
5. Bernard Massey: *Mechanics of Fluids*, Taylor & Francis.

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**II B.Tech –I Semester EEE**

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**12AEC07 PRINCIPLES OF ELECTRONIC DEVICES AND CIRCUITS**

**Objectives:**

1. To familiarize the student with the principles of P-N junction diode, BJT and JFET and characteristics of all devices.
2. To understand the Small signal analysis and its applications.

**Outcomes:**

After Completion of this course the student will be able to

1. Understand the Operating principles of P-N junction Diode, BJT and JFET in various configurations and their applications in Electronic circuits.
2. Understand the various Biasing and stabilization circuits of BJT and JFET and design of RPS.
3. Understand the V-I characteristics of Tunnel Diode, Varactor Diode, Schottky Diode, Thermistor, SCR and UJT.

**UNIT I**

**P-N JUNCTION DIODE:** P-N Junction diode equation, volt-Ampere (V-I) characteristics, Temperature dependence of V-I characteristics, Ideal versus practical, Static and Dynamic Resistance, Diode equivalent circuits, Breakdown Mechanisms in Semiconductor Diodes, Zener diode characteristics.

**UNIT II**

**RECTIFIERS AND FILTERS:** PN junction diode as rectifier, Half wave rectifier , ripple factor, Full wave rectifier using Center Tapped and Bridge type, Harmonic components in rectifier circuits, Capacitor Filter, Inductor filter, L-section Filter, use of Zener diode as regulator.

**UNIT III**

**TRANSISTOR:** Transistor construction, BJT symbol, BJT operation, Transistor as an amplifier, Common Emitter, Common base and common collector configurations , Limits of operation and BJT specifications.

**UNIT IV**

**TRANSISTOR BIASING AND STABILISATION:** Operating point, DC & AC load lines, Importance of Biasing, Fixed bias, Emitter feedback bias, Collector to Emitter feedback bias, Voltage divider bias , Bias stability, Stabilization against variations in  $V_{BE}$  and  $I_{CO}$ , Compensation against variation in  $V_{BE}$  and  $I_{CO}$ , Thermal runaway, condition for thermal stability in CE Configuration.

**UNIT V**

**FIELD EFFECT TRANSISTOR:** The junction field effect transistor, Construction & principle of operation, Pinch-off voltage, Volt-Ampere characteristics, small signal model of JFET & MOSFET, MOSFET characteristics in Enhancement and Depletion modes.

**UNIT VI**

**SMALL SIGNAL ANALYSIS OF BJT AMPLIFIERS:** BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Measurement of h-parameters, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CB, CE and CC configurations, Simplified hybrid model, Miller's theorem and Dual of Miller's Theorem.

## **UNIT VII**

**FET AMPLIFIERS:** Common Source, Common Gate and Common Drain amplifiers using FET Model, Generalized FET Amplifier and Comparison between BJT and FET.

## **UNIT VIII**

**SPECIAL PURPOSE ELECTRONIC DEVICES:** Principle of operation and characteristics of Tunnel Diode (With help of energy band diagram), Varactor Diode, Principle of operation of Schottky barrier diode, Thermistor, Silicon Controlled Rectifier and Uni-Junction Transistor(UJT).

### **TEXT BOOKS:**

1. Millman.J, Christos C. Halkias, Integrated Electronics, TMGH Edition, 2008.
2. Boylestad.R.L and Louis Nashelsky, Electronics Devices and Circuits, 10<sup>th</sup> Edition, PEI/PHI, 2009.
3. David A.Bell, Fundamentals of Electronic Devices and Circuits, 5<sup>th</sup> Edition, Oxford University Press, 2008.

### **REFERENCE BOOKS:**

1. Adel S. Sedra, Kenneth C. Smith, Micro Electronic Circuits, 5<sup>th</sup> Edition, Oxford University Press, 2004.
2. Rober T. Paynter, Introductory Electronic Devices and Circuits, 7<sup>th</sup> edition, Pearson Education.
3. Salivahanan.S, Suresh Kumar.N, Vallavaraj.A, Electronic Devices and Circuits, second Edition, Tata-McGraw Hill Edition.

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**II B.Tech –I Semester EEE**

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**12AEE04 ELECTRICAL MACHINES-I**

**Objectives:**

1. To study the principles of electro mechanical energy conversion, Armature reaction and commutation in DC machines.
2. To understand types of DC generators and motors, and their characteristics and applications.
3. To discuss different methods of speed control of DC Motors and Testing of DC Machines.

**Outcomes:**

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

1. Understand the basic principles of electromagnetic laws, energy conversion and design aspects of electrical machines.
2. Will have knowledge about operating characteristics of generators, speed control of DC machines and their application in industry and domestic appliances.

**UNIT I**

**ELECTROMECHANICAL ENERGY CONVERSION:** Principles of energy conversion - Forces and Torque in magnetic field systems - Energy balance - Energy and force in a singly excited magnetic field system - Determination of magnetic force - co-energy-multi excited magnetic field systems.

**UNIT II**

**D.C GENERATORS:** Construction - Principle of operation - Action of commutator - Constructional features - Armature windings - Lap and wave windings - Simplex and Multiplex windings - Laminated Armature - E.M.F Equation - Problems.

**UNIT III**

**ARMATURE REACTION IN D.C GENERATOR:** Armature reaction - Cross-magnetizing and de-magnetizing AT/pole - Compensating winding - Commutation - Reactance voltage - Methods of improving commutation.

**UNIT IV**

**TYPE OF D.C GENERATORS:** Methods of Excitation - Separately excited and self-excited generator - build-up of E.M.F - Critical field resistance and critical speed - causes for failure of self excitation and remedial measures.

**UNIT V**

**LOAD CHARACTERISTICS OF D.C GENERATORS:** Load characteristics of shunt, series and compound generators - Parallel operation of D.C shunt generators - load sharing - Parallel Operation of dc Series generator - use of equalizer bar and cross connection of field winding - load sharing.

**UNIT VI**

**D.C MOTORS:** Principle of operation - Back E.M.F - Torque equation - characteristics and applications of shunt, series and compound motors - Armature reaction and commutation.

**UNIT VII**

**SPEED CONTROL OF D.C. MOTORS:** Armature voltage and field flux control methods - Ward-Leonard system - Principle of 3 point and 4 point starters - protective devices.

## **UNIT VIII**

**TESTING OF D.C. MACHINES:** Testing of D.C machines Losses - Constant & Variable losses - Calculation of efficiency - Condition for maximum efficiency - Methods of testing - Direct, Indirect and Regenerative testing - brake test - Swinburne's test - Hopkinson test - Field's test - Retardation test - separation of stray losses into mechanical and magnetic losses.

### **TEXT BOOKS:**

1. Bimbra.P.S: *Electrical Machines*, Khanna Publishers
2. Kamakshaiyah.S: *Electromechanics-I*, Overseas publishers Pvt Ltd.
3. Fitzgerald.A.E, Kingsley. C and Umans. S: *Electric Machinery*, Mc Graw-Hill Companies.

### **REFERENCE BOOKS:**

1. Clayton & Hancock: *Performance and Design of D.C. Machines*, BPB Publishers
2. Battacharya.S.K: *Electrical machines*, TMH Edn Pvt, Ltd.,
3. Gupta.B.R, vandana Singhal: *Fundamentals of electric Machines*, New age International publishers.
4. Nagrath.I.J & Kothari.D.P: *Electric Machines*, Tata Mc Graw-Hill Publishers

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**12AEE05 GENERATION OF ELECTRIC POWER**

**Objectives:**

1. Large amount of electric power is being demanded by the industries and domestic appliances
2. This course deals with the generation of conventional & non-conventional sources of energy along with economic aspects.
3. To achieve this adequate exposure to Thermal, Hydro, Nuclear power stations, solar, wind, biogas, geothermal & ocean energy is provided.

**Outcomes:**

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

1. Gain knowledge of construction and operation of Thermal, Hydro and Nuclear Power Stations.
2. Familiarize with the generation of electric power through Renewable Energy Sources and financial management.

**UNIT I**

**THERMAL POWER STATIONS:** Line diagram of the Thermal Power Station (TPS) showing paths of coal, steam, water ash and flue gasses - Brief description of TPS components - Economizers - Boiler Super heaters - Turbines, Condensers, Chimney and cooling towers.

**UNIT II**

**HYDRO POWER STATIONS:** Selection of site – classification – Layout - Description of main components.

**NUCLEAR POWER STATIONS:** Nuclear Fission and Chain reaction - Nuclear fuels principle of operation of Nuclear reactor - Reactor Components – Moderators - Control rods, Reflectors and Coolants - Radiations Hazards - Shielding and safety precautions - Types of Nuclear reactors and brief description of Pressurized Water Reactor (PWR), Boiling Water Reactor (BWR) and Fast Breeder Reactor (FBR).

**UNIT III**

**BASICS OF SOLAR ENERGY GENERATION:** Role and potentials of solar energy options - principles of solar radiation - Flat plate and concentrating solar energy collectors - Different methods of solar energy storage - Solar energy applications: Heating, cooling, distillation and drying - Economic aspects.

**UNIT IV**

**BASICS OF WIND ENERGY GENERATION:** Role and potentials of wind energy option horizontal and vertical axis wind mills - Performance characteristics - Betz coefficient – application - Economic aspects.

**UNIT V**

**BASICS OF BIO GAS ENERGY GENERATION:** Principles of Bioconversion - types of Biogas digesters - Characteristics of Bio-gas Utilization - Economic and environmental aspects.

**UNIT VI**

**BASICS OF GEOTHERMAL AND OCEAN ENERGY GENERATION:** Principle of Geothermal energy - Methods of Harnessing - Principle of Ocean energy - Tidal and wave energy - Mini Hydel plants - Economic aspects.

## **UNIT VII**

**ECONOMIC ASPECTS OF POWER GENERATION:** Load curve - Load duration and integrated load duration curves - load, demand, diversity capacity, utilization and plant use factors - Numerical problems - Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

## **UNIT VIII**

**TARIFF METHODS:** Desirable Characteristics of a Tariff Method - Tariff methods: Flat Rate, Block-Rate, two-part, three-part, and power factor tariff methods and numerical problems.

## **TEXT BOOKS**

1. Soni.M.L, Gupta.P.V, Bhatnagar.U.S and Chakraborti.A: *A Text Book on" Power Systems Engineering*, Dhanpat Rai & Co.Pvt.Ltd., 1999.
2. Mehta.V.K and Rohit Mehta: *Principles of power systems*, S.Chand & Company Ltd, New Delhi 2004.
3. Rajput.R.K: *Power systems Engineering*, Laxmi Publishers.

## **REFERENCE BOOKS**

1. Deshpande.M.V: *Elements of power station design and practice*, Wheeler Publishing.
2. Singh.S.N: *Electrical power Generation Transmission and Distribution*, PHI, 2003.
3. Rai.G.D: *Non Conventional energy sources*, Khanna Publishers.

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**II B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-	-	<b>3</b>	<b>2</b>

**12ACE09 BASIC FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**

**Objectives:**

- 1. To teach students about flow measuring devices such as orifice meter, venturimeter and turbine flow meter.*
- 2. To help the students acquire knowledge about flow through pipes.*
- 3. To help the students in understanding the working of turbines and pumps.*

**Outcomes:**

*After completion of this course the student will be able to:*

- 1. Analyze various flow problems and fluid characteristics.*
- 2. Determine the losses of flow through pipes*
- 3. Understand the working of turbines and Pumps.*

**LIST OF EXPERIMENTS**

1. Calibration of Venturimeter.
2. Calibration of Orificemeter
3. Determination of friction factor for a given pipe.
4. Determination of loss of head due to sudden contraction in a pipe line.
5. Impact of Jets on vanes.
6. Performance test on Pelton Wheel Turbine.
7. Performance test on Francis Turbine.
8. Performance test on Single stage Centrifugal Pump.
9. Performance test on Multi stage Centrifugal Pump.
10. Turbine Flow meter.

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**II B.Tech –I Semester EEE**

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-	-	<b>3</b>	<b>2</b>

**12AEE06 ELECTRICAL CIRCUITS & SIMULATION LAB**

**PART-A:**

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

1. Verification of Superposition & Reciprocity theorems
2. Verification of Thevenin's & Norton's theorems
3. Verification of Millmann's theorem & Maximum power transfer theorem
4. Determination of self, Mutual inductance & Coefficient of coupling of pair of coils.
5. Series & Parallel Resonance
6. Locus diagrams of RL and RC series circuits
7. Impedance, Admittance & Transmission parameters of twoport network.

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Simulation of Tellegan's & Compensation theorems.
9. Simulation of RL & RC series circuits.
10. Analysis of 3-phase circuit representing the generator transmission line and load.  
Plotting three phase currents & Neutral current using PSPICE.
11. PSPICE simulation of DC circuits (Thevenin's equivalent, Transfer function).
12. Formulation of Network equations by loop and nodal analysis using PSPICE.

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**II B.Tech –II Semester EEE**

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**12AHS09 ENVIRONMENTAL STUDIES  
(Common to CE, EEE and ME)**

**Objectives:**

1. To create awareness about environmental problems and find the solutions to solve the problems.
2. To motivate the public to participate in the environment protection to free man from all sorts of pollutions.
3. To know global atmospheric changes and inculcate the public to conserve and to use the natural resources judiciously.

**Outcomes:**

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

1. Aware of how to conserve the natural resources
2. Aware of maintain the ecological balance based on the cultural and biological diversity
3. Solve the different varieties of environmental problems.

**UNIT-I**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** Definition, Scope and Importance – Need for Public Awareness.

**UNIT-II**

**NATURAL RESOURCES:** Renewable and non-renewable resources-Natural resources and associated problems: Forest resources: Use and over-exploitation, deforestation, case studies – Timber extraction, Mining, Dams and other effects on forest and tribal people .Water resources: Use and over utilization of surface and ground water , Floods, Drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Renewable and Non-renewable energy resources

**UNIT-III**

**ECOSYSTEMS:** Concept of an ecosystem, Structure and function of an ecosystem – Producers, Consumers and decomposers – Energy flow in the ecosystem –Ecological Succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:  
a.Forest ecosystem b. Grassland ecosystem c. Desert ecosystem  
d.Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT-IV**

**BIODIVERSITY AND ITS CONSERVATION:** Introduction, Definition, Types of biodiversity(genetic, species and ecosystem diversity)-Bio-geographical classification of India-Value of biodiversity(Consumptive use, Productive use, Social use, Ethical use, Aesthetic and Option values)-Biodiversity at global, national and local levels-India as a mega diversity nation-Hot spots of biodiversity-Threats to biodiversity(habitat loss, Poaching of wildlife, man-wildlife conflicts)-Endangered and endemic species of India-Conservation of biodiversity(In-situ and Ex-situ conservation of biodiversity).

**UNIT-V**

**ENVIRONMENTAL POLLUTION:** Definition, causes, effects and control measures of:  
a.Air Pollution b. Water Pollution c. Soil Pollution d. Marine Pollution e. Noise Pollution  
f. Thermal Pollution g. Nuclear hazards  
Solid Waste Management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution-Pollution case studies-Disaster management: Floods, Earthquake, Cyclone and Landslides.

## **UNIT-VI**

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

## **UNIT-VII**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nation, Population explosion-Family Welfare Programme-Environment and human health-Human Rights-Value Education-HIV/AIDS-Women and Child Welfare-Role of Information Technology in Environment and human health-Case studies.

## **UNIT-VIII**

**FIELD WORK:** Visit to a local area to document environmental assets River/forest/grassland/hill/mountain-Visit to a local polluted site-Urban/rural Industrial/Agricultural Study of common plants, insects, birds-river, hillslopes etc.

### **TEXT BOOKS:**

1. Erach Bharucha: *Textbook of Environmental Studies for Undergraduate courses*, from UGC.
2. Dr.Raghavan Nambiar.K: *Text Book of Environmental Studies*, Scitech publications, 2010.
3. Benny Joseph: *Environmental Studies*, Mc.GrawHill Publications, 2010.
4. Mukkante.K: *Textbook of Environmental Studies*, S.Chand Publications.

### **REFERENCE BOOKS:**

1. Dr.Suresh.K.Dhameja: *Environmental Studies*, S.K. Kataria & Sons Publishers, 2012.
2. Sharma.J.P: *Comprehensive Environmental Studies*, Laxmi Publications, 2010.

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**II B.Tech –II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AHS10 ENGINEERING MATHEMATICS –III  
(Common to EEE and ECE)**

**Objectives:**

1. To understand the concepts of complex numbers, residual theorems.
2. To introduce the special functions like  $\beta$ ,  $\gamma$  functions
3. To apply the above concepts to engineering applications.

**Outcomes:**

- The student is able to
1. represent a function as a series of sine and cosine terms of different frequencies and understand the periodic phenomenon.
  2. appreciate the usage of above concepts to engineering applications.

**UNIT-I**

**SPECIAL FUNCTIONS:** Gamma and Beta Functions - their properties - Evaluation of Improper integrals - Bessel and Legendre's functions - properties-Rodrigue formula - Recurrence relation - Orthogonality.

**UNIT-II**

**FUNCTIONS OF COMPLEX VARIABLE:** Continuity - Differentiability - Analyticity - properties - Cauchy Riemann equations in Cartesian and polar coordinates - Harmonic conjugate harmonic functions - Milne Thompson method.

**UNIT-III**

**ELEMENTARY FUNCTIONS:** Elementary functions and their properties -  $e^z$ ,  $\sin z$ ,  $\cos z$ ,  $\log z$  and  $\cosh z$ .

**UNIT-IV**

**COMPLEX INTEGRATION:** Line integral - Cauchy's integral theorem - Cauchy's integral formula - General integral formula.

**UNIT- V**

**COMPLEX POWER SERIES:** Expansion in Taylor's series, Maclaurin's series and Laurent's series Singular point - isolated singular point-pole of order m - Essential singularity.

**UNIT-VI**

Residues - Residue theorem-Evaluation of integrals of the type

- (a) improper real integrals  $\int f(x) dx$  in  $[-\infty, \infty]$
- (b)  $\int f(\cos \theta, \sin \theta) d \theta$  in  $[c, c+2\pi]$
- (c)  $\int e^{imx} f(x) dx$  in  $[-\infty, \infty]$

**UNIT-VII**

Argument Principle - Rouché's theorem - Determination of number of zeros of complex polynomials - maximum Modulus principle - Fundamental theorem of algebra, Liouville's theorem.

## **UNIT-VIII**

**CONFORMAL MAPPING:** Conformal mapping of functions  $e^z$ ,  $\ln z$ ,  $z^2$ ,  $\sin z$ ,  $\cos z$ . - Translation - rotation - magnification and inversion - Bilinear transformation - Determination of bilinear transformation mapping three given points.

### **Text Books:**

1. Iyengar T.K.V, Krishna Gandhi .B and others ,*A Text Book of Engineering mathematics*, Vol-III ,New Delhi, S.Chand & company,2012.
2. Sankaraiah.C, *A Text Book of Engineering Mathematics*, Vijayawada, V.G.S Book Links,2010.
3. Rukmangadachari.E., Kesava reddy.E. *A Text Book of Engineering Mathematics -III*, Pearson Education

### **References:**

1. Ramana .B.V., *A Text Book of Engineering Mathematics*, New Delhi,,Tata Mc Graw Hill.2007.
2. Grewal B.S, *Higher Engineering Mathematics*, New Delhi, Khanna publication,2004.
3. Churchile and Brown, *Complex Variables* .

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**II B.Tech –II Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AEE11 TRANSMISSION OF ELECTRICAL POWER**

**Objectives:**

*This subject is an extension of Generation of Electric power.*

1. *It deals with the basic theory of calculation of transmission line parameters, transmission line modeling and their performance analysis.*
2. *Also this subject gives emphasis on power system transients, Mechanical design of transmission lines, cables and insulators.*

**Outcomes:**

*After completion of the course the student will be able to:*

1. *Determine the transmission line parameters and their performance.*
2. *Understand the effects of Sag and Corona on transmission lines, study issues of insulators , cables and power system transients.*

**UNIT I**

**TRANSMISSION LINE PARAMETERS:** Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase - single and double circuit lines - concept of GMR & GMD - symmetrical and asymmetrical conductor configuration with and without transposition - Numerical Problems - Calculation of capacitance for 2-wire and 3-wire systems - effect of ground on capacitance - Capacitance calculations for symmetrical and asymmetrical single phase and three phase - single and double circuit lines - Numerical Problems.

**UNIT II**

**PERFORMANCE OF SHORT AND MEDIUM TRANSMISSION LINES:** Classification of Transmission Lines - Short, medium and long transmission lines and their model - representations - Nominal-T, Nominal- $\pi$  and A, B, C, D Constants - Numerical Problems - Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

**UNIT III**

**PERFORMANCE OF LONG TRANSMISSION LINES:** Long Transmission Line - Rigorous Solution - evaluation of A,B,C,D Constants - Interpretation of the Long Line Equations - Representation of Long lines - Equivalent-T and Equivalent- $\pi$  - surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation - Ferranti effect - Charging current.

**UNIT IV**

**POWER SYSTEM TRANSIENTS:** Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems) - Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

**UNIT V**

**CORONA:** Corona - Description of the phenomenon - factors affecting corona - critical voltages and power loss - Radio Interference.

## **UNIT VI**

**OVERHEAD LINE INSULATORS:** Types of Insulators - String efficiency - Methods for improvement - Numerical Problems - voltage distribution - calculation of string efficiency - Capacitance grading and Static Shielding.

## **UNIT VII**

**SAG AND TENSION CALCULATIONS:** Sag and Tension Calculations with equal and unequal heights of towers - Effect of Wind and Ice on weight of Conductor - Numerical Problems - Stringing chart and sag template and its applications.

## **UNIT VIII**

**UNDERGROUND CABLES:** Types of Cables – Construction - Types of Insulating materials - Calculations of Insulation resistance and stress in insulation - Numerical Problems - Capacitance of single core and three Core belted cables - Numerical Problems - Grading of Cables - Capacitance grading - Numerical Problems - Description of Inter-sheath grading.

### **TEXT BOOKS:**

1. Soni M.L, Gupta P.V, Bhatnagar U.S, Chakrabarthy.A: *A Text Book on Power System Engineering*, Dhanpat Rai & Co Pvt. Ltd.
2. Wadhwa C.L: *Electrical power systems*, New Age International (P) Limited, Publishers, 1998.
3. John J Grainger, William D Stevenson: *Power system Analysis*, 4th edition, TMC companies.

### **REFERENCE BOOKS:**

1. Rajput R. K: *Power System Engineering* Laxmi Publications, 1<sup>st</sup> Edition.
2. Gupta B.R: *Power System Analysis and Design*, 6<sup>th</sup> Revised Edition, S. Chand & Co, 2010.
3. Nagarath I.J.and Kothari D.P: *Modern Power System Analysis*, 2<sup>nd</sup> Edition, Tata McGraw Hill.
4. Turan Gonen: *Electric Power Transmission System Engineering Analysis and Design*, 2<sup>nd</sup> Edition, CRC Press.
5. Nasar.S.A: *Electric Power Systems*, Revised 1<sup>st</sup> Edition, Schaum's Outline Series, TMH.

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**II B.Tech –II Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AEC15 ANALOG ELECTRONIC CIRCUITS**

**Objectives:**

1. To understand the analysis and design of Single Stage Amplifiers, Feedback Amplifiers, Large signal Amplifiers and Oscillator circuits.
2. To know the switching characteristics of various devices and Multivibrators.

**Outcomes:**

After Completion of this course the student will be able to:

1. Design Single stage Amplifiers, Feedback Amplifiers, Large Signal amplifiers, Oscillators and Multivibrators.
2. Design the Amplifier for a required Bandwidth.

**UNIT I**

**SINGLE STAGE AMPLIFIERS DESIGN AND ANALYSIS:** Review of CE, CB, CC & CS amplifiers, Classification of Amplifiers, Distortion in Amplifiers, Approximate analysis, Comparison of CE, CB and CC amplifiers.

**UNIT II**

**BJT & FET FREQUENCY RESPONSE:** General frequency considerations, Low frequency analysis, Low Frequency response of BJT amplifiers, Low frequency response of FET amplifiers, Miller Effect Capacitance, High Frequency Response of BJT amplifier and Square wave testing.

**UNIT III**

**FEEDBACK AMPLIFIERS:** Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effects of Negative feedback on various feedback amplifiers: Voltage Series, Voltage Shunt, Current Series and Current Shunt feedback configurations.

**UNIT IV**

**OSCILLATORS:** Conditions for Oscillations, RC and LC Type Oscillators, Crystal Oscillators, Frequency and Amplitude Stability of Oscillators, Generalized Analysis of LC oscillators, Hartley, Colpitts, RC-Phase Shift and Wien-Bridge and Quartz Oscillators.

**UNIT V**

**LARGE SIGNAL AMPLIFIERS:** Class-A Power Amplifier, Maximum Value of Efficiency of class-A Amplifiers, Transformer Coupled Class-A Power Amplifier, Class-B Power Amplifier: Push Pull amplifier, Complimentary-Symmetry circuits, Class-AB Power Amplifier, Phase Inverters, Transistor Power Dissipation, Thermal Run away and Heat Sinks.

**UNIT VI**

**LINEAR WAVESHAPING:** High Pass, Low Pass RC circuits and their response for Sinusoidal, Step, Pulse, Square and Ramp inputs.

**CLIPPERS AND CLAMPERS:** Diodes Clippers, Transistor Clipper, Clipping at two independent levels, Transfer Characteristics of Clippers, Emitter Coupled Clipper, Comparators, Applications of Voltage Comparators, Clamping operation, Clamping circuits using diode with different inputs, Clamping Theorem, Practical Clamping circuits, Effect of Diode characteristics on clamping voltage and Transfer characteristics of clampers.

## **UNIT VII**

**SWITCHING CHARACTERISTICS OF DEVICES:** Diode as a switch, Piecewise linear diode characteristics, Diode Switching Times, Transistor as a Switch, Breakdown Voltage considerations of transistor, Saturation parameters of Transistors and their variations with temperature, Design of Transistor Switch, Transistor Switching Times.

## **UNIT VIII**

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

### **TEXT BOOKS:**

1. Anand Kumar: Pulse & Digital circuits, PHI publication
2. Boylestad.R.L and Louis Nashelsky, Electronics Devices and Circuits, 10<sup>th</sup> Edition, PEI/PHI, 2009.

### **REFERENCE BOOKS:**

1. Millman.J Halkias.C, Integrated Electronics, Tata Mc-graw Hill Edition, 2008.
2. David A.Bell, Solid State Pulse Circuits, 4<sup>th</sup> Edition, Prentice Hall of India.
3. Jacob Millman, Herbert Taub and Mothiki S Prakash Rao, Pulse Digital & Switching waveforms, 2<sup>nd</sup> Edition 2008, Tata McGraw Hill Company.

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**II B.Tech –II Semester (ECE & EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AEC12 SWITCHING THEORY AND LOGIC DESIGN  
(Common to ECE & EEE)**

**Objectives:**

1. To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions.
2. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
3. To illustrate the concept of synchronous and asynchronous sequential circuits.

**Outcomes:**

After completion of the course, the student will be able to:

1. Design and Analyze combinational and sequential circuits for various practical problems using basic gates and flip flops.
2. Implement LSI and MSI circuits using programmable logic devices (PLDs).
3. Demonstrate knowledge of hazards and race conditions generated within asynchronous circuits.

**UNIT I**

**NUMBER SYSTEMS & CODES:** Philosophy of number systems, Complement representation of negative numbers, Binary Arithmetic, Binary Codes-Error Detecting & Error Correcting Codes and Hamming Codes.

**UNIT II**

**BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS:** Fundamental postulates of Boolean Algebra, Basic Theorems and Properties, Switching Functions–Canonical and Standard forms, Algebraic Simplification of Digital Logic Gates, Properties of XOR gates , Universal gates-Multilevel NAND/NOR realizations.

**UNIT III**

**MINIMIZATION OF SWITCHING FUNCTIONS:** Map method, Prime Implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant Chart, simplification rules.

**UNIT IV**

**COMBINATIONAL LOGIC DESIGN**

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions, Parity bit generator, Code-converters, Hazards and Hazard free realizations.

**UNIT V**

**PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC:** Basic PLD's-ROM, PROM, PLA, and PLD Realization of Switching functions using PLD's. Capabilities and Limitations of Threshold gate, Synthesis of Threshold functions and Multigate Synthesis.

**UNIT VI**

**SEQUENTIAL CIRCUITS - I:** Classification of Sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples), Basic flip-flops-Triggering and Excitation Tables, Shift Registers, Steps in Synchronous Sequential circuit design, Design of modulo-N Counters, Ring & Johnson counters, Serial binary adder and Sequence Detector.

## **UNIT VII**

**SEQUENTIAL CIRCUITS - II:** Finite State Machine-Capabilities and Limitations, Mealy and Moore models, Minimization of completely specified and incompletely specified sequential machines-Partition techniques and Merger chart methods, Concept of Minimal cover table.

## **UNIT VIII**

**ALGORITHMIC STATE MACHINES :** Salient features of the ASM chart-Simple examples-System design using data path and control subsystems, control implementations-examples of Weighing machine and Binary multiplier.

### **TEXTBOOKS:**

1. Zvi Kohavi, Switching & Finite Automata Theory, TMH, 2<sup>nd</sup> Edition, 2008.
2. Morris Mano, Digital Design, PHI, 3<sup>rd</sup> Edition, 2006.
3. Bhanu Bhaskara, Switching Theory & Logic Design, I<sup>st</sup> Edition, MGH, 2012.

### **REFERENCES:**

1. Fletcher, An Engineering Approach to Digital Design, PHI.
2. Charles H. Roth, Fundamentals of Logic Design, Thomson Publications, 5th Edition, 2004.
3. John M. Yarbrough, Digital Logic Applications and Design, Thomson Publications, 2006.

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**II B.Tech –II Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AEE12 ELECTRICAL MACHINES –II**

**Objectives:**

1. To familiarize the construction details, principle of operation, prediction of performance, methods of 1- $\Phi$  testing and 3- $\Phi$  transformers.
2. To study the construction, principle of operation and performance of 3 phase induction motors.
3. To learn the starting and speed control of 3 phase induction motors.

**Outcomes:**

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

1. Acquire the concept of single phase and three phase transformers and their applications.
2. Acquire the knowledge about the utilization of transformers in distribution, transmission of power and speed control of 3 phase induction motors.

**UNIT I**

**SINGLE PHASE TRANSFORMERS:** Types - constructional details - Minimization of Hysteresis and eddy current losses - EMF equation - operation on no-load and on-load Phasor diagrams

**UNIT II**

**SINGLE PHASE TRANSFORMERS – PERFORMANCE & EFFICIENCY:** Equivalent circuit - losses and efficiency - Regulation - All day efficiency - Effect of variations of frequency & supply voltage on iron losses - Auto transformers - Principle of operation - Equivalent circuit - comparison with two winding transformers.

**UNIT III**

**TESTING OF SINGLE PHASE TRANSFORMERS:** OC and SC tests – Equivalent circuit parameters - Predetermination of efficiency and regulation - Separation of losses - Sumpner's test - Parallel operation with equal and unequal voltage ratios.

**UNIT IV**

**THREE PHASE TRANSFORMERS:** Three phase connections - Y/Y, Y/ $\Delta$ ,  $\Delta$ /Y,  $\Delta$ / $\Delta$  and open  $\Delta$  - Third harmonics in phase voltages - Three winding transformers - Tertiary windings - Scott connection.

**UNIT V**

**THREE PHASE INDUCTION MOTORS:** Construction details of squirrel cage and wound rotor Induction motors - Production of a rotating magnetic field - principle of operation - Rotor EMF and rotor frequency - Rotor Reactance - Rotor Current - Power factor at standstill and running condition.

**UNIT VI**

**CHARACTERISTICS OF INDUCTION MOTORS:** Equivalent circuit - Phasor diagram - Torque equation - Torque slip characteristics - Rotor power input - Rotor copper loss and mechanical power developed and their inter relation - Expressions for maximum torque and starting torque - Crawling and Cogging - Double cage and deep bar rotors.

**UNIT VII**

**TESTING OF INDUCTION MOTORS:** No load and Blocked rotor tests - Construction of Circle diagram - Predetermination of performance characteristics - Methods of starting - Calculation of starting current and torque

## **UNIT VIII**

**SPEED CONTROL METHODS OF INDUCTION MOTOR:** Methods of speed control - Change of frequency - Pole changing - Injection of an EMF into rotor circuit (qualitative treatment only) - Cascade connection - Induction Generator - Principle of operation.

### **TEXT BOOKS:**

1. Fitzgerald.A.E, Kingsley.C and Umans.S: *Electric machinery*, 5<sup>th</sup> edition, Mc Graw Hill Companies.
2. Bhimbra.P.S: *Electrical machines*, Khanna Publishers.
3. Theraja.B.L & Theraja.A.K: *Electrical Technology*, Volume II, First multi color edition 2005

### **REFERENCE BOOKS:**

1. Say.M.G: *Performance and Design of AC Machines*, BPB Publishers
2. Langsdorf: *Theory of Alternating Current Machinery*, 2<sup>nd</sup> edition, Tata McGraw-Hill Companies.
3. Nagrath.I.J & Kothari.D.P: *Electric Machines*, 7<sup>th</sup> Edition, Tata Mc Graw Hill,2005.
4. Kamakashaiah.S: *Electro mechanics-II (transformers and induction motors)*, Hitech publishers.
5. Pustin & Lyoid:

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**II B.Tech –II Semester EEE**

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-	-	<b>3</b>	<b>2</b>

**12AEC05 ELECTRONIC DEVICES & CIRCUITS LAB**

**PART-A:**

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

1. Forward and Reverse bias characteristics of PN Junction diode
2. Zener diode characteristics and Zener as voltage Regulator
3. Half wave Rectifier with and without filters
4. Full wave rectifier with and without filters
5. Input and output characteristics of transistor in CB configuration
6. Input and output characteristics of transistor in CE configuration
7. FET characteristics

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Frequency response of CE amplifier
9. Frequency response of CC amplifier
10. Frequency response of Common source FET amplifier
11. UJT characteristics
12. SCR characteristics

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**II B.Tech –II Semester EEE**

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-	-	<b>3</b>	<b>2</b>

**12AEE13 ELECTRICAL MACHINES –I LAB**

**PART-A:**

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

1. Magnetization characteristics (O.C.C) of dc shunt generator-Determination of critical field resistance and critical speed.
2. Load test on dc shunt generator- External characteristics of generator
3. Load test on dc compound generator –Determination of performance curves.
4. Swinburne’s tests on dc shunt motor – Predetermination of efficiency as generator and motor.
5. Load test on dc shunt motor - Determination of performance curves.
6. Speed control of dc shunt motor    - Armature voltage control.  
  - Field control
7. Hopkinson’s test

**PART-B:**

**Any Three of the following experiments are required to be conducted:**

8. Separation of losses on dc shunt motor
9. Field’s test on dc series motor-Determination of efficiency
10. Retardation test on dc shunt motor- Determination of losses.
11. Load test on dc compound motor.
12. Load test on dc series generator.

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**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AHS11 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS  
(Common to CE,EEE & ME)**

**Objectives:**

1. This course equip the students to develop economic way of thinking in dealing with practical business problems and challenges
2. Also enable the students by providing the basic knowledge of book keeping, accounting and make analysis of financial statements of a business organization.

**Outcomes:**

*After completion of this course the student will be able to:*

1. Good knowledge of Managerial Economics and
2. Know the application of financial accounting in the field of Engineering.

**UNIT I**

**INTRODUCTION TO MANAGERIAL ECONOMICS:** Definition - Nature and scope of Managerial Economics - Relation with other disciplines - Demand Analysis - Demand Determinants - Law of Demand and its exceptions.

**UNIT II**

**ELASTICITY OF DEMAND:** Definition – Types - Measurement and Significance of Elasticity of Demand - Demand forecasting - Factors governing demand forecasting - purposes of demand forecasting - Methods of demand forecasting (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting).

**UNIT III**

**THEORY OF PRODUCTION AND COST ANALYSIS:** Production Function – Isoquants and Isocosts – MRTS - Least cost combination of inputs - Cobb-Douglas production function - Laws of returns - Internal and external economies of scale.

**Cost Analysis:** Cost concepts - Opportunity cost - Fixed Vs Variable costs - Explicit costs Vs Implicit costs - Out of pocket costs Vs Imputed costs - Break-Even Analysis (BEA) - Determination of Break Even Point (Simple Problems) - Managerial significance and Limitations of BEA.

**UNIT IV**

**INTRODUCTION TO MARKETS AND PRICING POLICIES:** Market structures - Types of competition - Features of perfect competition – Monopoly - Monopolistic competition - Price-Output determination under perfect competition and Monopoly - Methods of Pricing-cost plus pricing - Marginal cost - Limit pricing - Skimming pricing - Bundling pricing - Sealed bid pricing and peak load pricing.

**UNIT V**

**BUSINESS ORGANISATIONS AND NEW ECONOMIC ENVIRONMENT:** Characteristic features of business - Features and Evaluation of sole proprietorship – partnership - Joint Stock Company - public enterprises and their types - changing business environment in post - Liberalization scenario.

**UNIT VI**

**CAPITAL AND CAPITAL BUDGETING:** Capital and its significance - Types of capital - Estimation of Fixed and working capital requirements - Methods and sources of raising finance - Nature and scope of capital budgeting - Features of capital budgeting proposal

- Methods of capital budgeting – Payback Period - Accounting Rate of Return (ARR) - Net Present value NPV) - Internal Rate of Return (IRR) and Profitability Index (PI) Methods (Simple problems).

#### **UNIT VII**

**INTRODUCTION TO FINANCIAL ACCOUNTING:** Double-Entry Book Keeping - Journal, Ledger, Trial Balance - Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

#### **UNIT VIII**

**FINANCIAL ANALYSIS THROUGH RATIOS:** Computation, Analysis and Interpretation of financial statements through Liquidity Ratios (Current and Quick ratio) - Activity ratios (Inventory Turnover Ratio and Debtor Turnover Ratio) - Capital Structure Ratios (Debt-Equity Ratio, Interest Coverage Ratio) and Profitability ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratios and EPS).

#### **TEXT BOOKS:**

1. Aryasri: *Managerial Economics and Financial Analysis*, 4/e, TMH, 2009.
2. Varshney & Maheswari: *Managerial Economics*, Sultan Chand, 2009.

#### **REFERENCES**

1. Premchand Babu, Madan Mohan: *Financial Accounting and Analysis*, Himalaya, 2009
2. Siddiqui.S.A and Siddiqui.A.S: *Managerial Economics and Financial Analysis*, New Age International,. 2009.
3. Joseph G. Nellis and David Parker: *Principles of Business Economics*, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: *Managerial Economics in a Global Economy*, Cengage, 2009.
5. Ahuja.H.L: *Managerial Economics*, S.Chand, 3/e, 2009
6. Dr.M.A.Arulanandam & Dr.K.S.Raman: *Financial Accounting*, Himalaya Publishing House.

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**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AEC25 LINEAR AND DIGITAL IC APPLICATIONS**

**Objectives:**

1. To introduce the basic building blocks of linear integrated circuits and various applications of Op-Amp.
2. To learn the theory and applications of Analog Filters, Timers and PLL.
3. To design a hardware utilizing the three basic VHDL modeling styles, data flow, structural and behavioral.
4. To design a combinational logic circuit and sequential logic circuit utilizing VHDL.

**Outcomes:**

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

1. Acquire basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.
2. Design digital systems using a hardware description language, VHDL.

**UNIT I**

**DIFFERENTIAL AMPLIFIER:** Characteristics of OP Amps, Integrated Circuits, Types, Classification, Package Types and Temperature Ranges, Power Supplies for Op-Amp, Block Diagram of Op-Amp, Ideal and Practical Op-Amp Specifications, DC and AC Characteristics, 741 Op-Amp & its features, FET Input Op-Amps, Op-Amp parameters & Measurements: Input & Output Offset Voltages & Currents, Slew Rate, CMRR, PSRR, Drift and Frequency Compensation technique.

**UNIT II**

**LINEAR & NON-LINEAR APPLICATIONS OF OP-AMPS:** Inverting and Non Inverting Amplifiers, Difference Amplifier, Instrumentation Amplifier, Integrator and Differentiator and Buffers.

Non-Linear function generation: Comparators, Multivibrators, Triangular and Square Wave Generators, Log and Antilog amplifiers, Precision Rectifiers.

**UNIT III**

**ANALOG FILTERS:** Introduction, Butterworth First Order and Second Order LPF and HPF, Band Pass, Band Reject and All Pass filters.

**UNIT IV**

**TIMERS & PHASE LOCKED LOOPS:** Introduction to 555 Timer, Functional diagram, Astable and Monostable Operation and its Applications, IC 565 PLL Functional Diagram and its Applications.

**UNIT V**

**BIPOLAR LOGIC AND CMOS LOGIC:** Introduction to Logic Families, Bipolar Transistor Logic TTL families, Emitter Coupled Logic, Comparison of various Logic Families, Familiarity with standard 74XX and CMOS 40XX Series ICs and Specifications, CMOS Logic, CMOS Steady State Electrical Behavior, CMOS Dynamic Electrical Behavior and CMOS Logic Families.

**UNIT VI**

**THE VHDL HARDWARE DESCRIPTION LANGUAGE:** Design Flow, Program Structure, Types and Constants, Function and Procedures, Libraries and Packages, Structural Design Elements, Data Flow Design Elements, Behavioral Design Elements, Simulation and Synthesis.

## **UNIT VII**

**COMBINATIONAL LOGIC DESIGN:** Decoders, Encoders, Three state devices, Multiplexers and Demultiplexers, Code converters, EX-OR gates and Parity Circuits, Comparators, Adders and Subtractors, ALUs, Combinational Multipliers and VHDL models for the above ICs.

## **UNIT VIII**

**SEQUENTIAL LOGIC DESIGN:** Latches and Flip-Flops, PLDs, Counters, Shift Register and their VHDL models.

### **TEXT BOOKS:**

1. A. Gayakwad Ramakanth, Op-Amps & Linear ICs, 4<sup>th</sup> Edition, PHI, 2009.
2. John F.Wakerly, Digital Design principles & Practices, 3<sup>rd</sup> Edition, PHI/Pearson Education Asia, 2005.
3. J Bhaskar, VHDL Primer, 3<sup>rd</sup> Edition, Pearson Education/PHI.

### **REFERENCE BOOKS:**

1. M.Fiore Cengage James, Op amps & linear Integrated Circuits Concepts & Applications, 2009.
2. D.Roy Chowdhury, Linear Integrated Circuits, 2<sup>nd</sup> Edition, New Age International (p) Ltd, 2003.
3. H.Roth.Jr, Digital System Design using VHDL, 1<sup>st</sup> Edition, Charles Cengage Publications.

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**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AEE16 ELECTRICAL MACHINES-III**

**Objectives:**

1. To study the construction, working principle and performance of salient pole and non-salient pole type of synchronous generators.
2. To emphasize the working principle of 3 phase synchronous machine and its power calculation.
3. To impart knowledge of power circle diagrams and also special machines.

**Outcomes:**

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

1. Understand the concept of synchronous machine and its power plant applications.
2. Acquire knowledge of Special Machines which are used in domestic and industrial purposes.

**UNIT I**

**SYNCHRONOUS GENERATOR:** Constructional features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings - Distributed and concentrated windings – Distribution, pitch and winding factors – E.M.F Equation.

**UNIT II**

**SYNCHRONOUS GENERATOR CHARACTERISTICS:** Harmonics in generated E.M.F – Suppression of Harmonics – Armature reaction - Leakage reactance – Synchronous reactance and Impedance – Experimental Determination - Phasor diagram – Load characteristics.

**UNIT III**

**REGULATION OF SYNCHRONOUS GENERATOR:** Regulation by synchronous impedance method - M.M.F method - Z.P.F method and A.S.A methods – Salient-pole alternators – Two reaction analysis – Experimental Determination of  $X_d$  and  $X_q$  (Slip test) - Phasor diagrams – Regulation of Salient pole alternators.

**UNIT IV**

**PARALLEL OPERATION OF SYNCHRONOUS GENERATORS:** Synchronizing alternators with infinite bus bars – Synchronizing power, Torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input - Analysis of short circuit current wave form – Determination of sub-transient - Transient and steady state Reactance's.

**UNIT V**

**SYNCHRONOUS MOTORS – PRINCIPLE OF OPERATION:** Theory of operation – Phasor diagram – Variation of current and power factor with excitation – V and Inverted V Curves - Power developed – Synchronous Condenser.

**UNIT VI**

**POWER CIRCLES:** Excitation and power circles – Hunting and its suppression – Methods of starting – Synchronous Induction motor.

**UNIT VII**

**SINGLE PHASE MOTORS:** Single phase Induction motor – Constructional features - Double revolving field theory – Elementary idea of cross-field theory – Split-phase motors – Shaded pole motor.

## **UNIT VIII**

**SPECIAL MOTORS:** Principle & performance of A.C. Series motor-Universal motor – Principle of Permanent Magnet Synchronous Motor (PMSM) – Brushless DC Motor (BLDC) – Switch Reluctance Motor (SRM) - stepper motor.

### **TEXT BOOKS**

1. Nagrath.I.J & Kothari.D.P: *Electric Machines*, 4<sup>th</sup> Edition, Tata Mc Graw-Hill Publishers, 2010.
2. Bimbra.P.S: *Electrical Machines*, Khanna Publishers.
3. Fitzgerald.A.E, Kingsley.C and Umans.S: *Electric Machinery*, 5<sup>th</sup> edition Mc Graw-Hill Companies, 1990.

### **REFERENCE BOOKS:**

1. Say.M.G: *The Performance and Design of A.C.Machines*, ELBS and Ptiman & Sons
2. Langsdorf: *Theory of Alternating Current Machinery*, 2<sup>nd</sup> edition, Tata Mc Graw-Hill.
3. Kamakshiah.S: *Electromechanics-III (Synchronous and single phase machines)*, Overseas publishers Pvt, Ltd.

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**III B.Tech –I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AEE17 CONTROL SYSTEMS**

**(Common to EEE & ECE)**

**Objectives:**

1. To introduce the students, the principles and applications of control systems in everyday life.
2. To focus the basic concepts of block diagram reduction, time domain analysis, solution to the time invariant systems.
3. To deal with different aspects of stability analysis of systems in frequency and time domain.

**Outcomes:**

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

1. Apply the concept of control systems for domestic and industrial purposes.
2. Acquire the concepts of stability analysis in time domain and frequency domain which are necessary to analyze any system performance.

**UNIT I**

**INTRODUCTION:** Concepts of Control Systems - Open Loop and closed loop control systems and their differences - Examples of control systems - Classification of control systems - Feed-back Characteristics - Effects of feedback - Mathematical models - Differential equations - Impulse Response and transfer functions - Translational and Rotational mechanical systems

**UNIT II**

**TRANSFER FUNCTION REPRESENTATION:** Transfer Function of DC Servo motor - AC Servo motor - Synchro Transmitter and Receiver - Block diagram algebra - Signal flow graph - Reduction using Mason's gain formula.

**UNIT III**

**TIME RESPONSE ANALYSIS:** Standard test signals - Time response of first order systems - Characteristic Equation of Feedback control systems - Transient response of second order systems - Time domain specifications - Steady state response - Steady state errors and error constants - Effects of proportional - Integral and derivative controls.

**UNIT IV**

**STABILITY ANALYSIS IN FREQUENCY DOMAIN:** The concept of stability - Routh's stability criterion - Qualitative stability and conditional stability - Limitations of Routh's stability analysis - The root locus concept - Construction of root loci-effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

**UNIT V**

**FREQUENCY RESPONSE ANALYSIS:** Frequency domain specifications - Bode diagrams - Determination of Frequency domain specifications and transfer function from the Bode Diagram - Phase margin and Gain margin - Stability Analysis from Bode Plots.

**UNIT VI**

**STABILITY ANALYSIS IN FREQUENCY DOMAIN:** Polar Plots - Nyquist Plots - Stability Analysis.

**UNIT VII**

**CLASSICAL CONTROL DESIGN TECHNIQUES:** Compensation techniques - Lag, Lead, Lead-Lag Controllers design in frequency domain - P, PD, PI, PID Controllers.

## **UNIT VIII**

**STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS:** Concepts of state - State variables and State Model - Derivation of state models from Block Diagrams – Diagonalization - Solving the Time invariant state Equations - State Transition Matrix and it's properties.

### **TEXT BOOKS:**

1. Kuo.B.C , Farid Golnaraghi: *Automatic Control Systems*, 8th edition,2003 John wiley and son's.
2. Nagrath.I.J and Gopal.M: *Control Systems Engineering*, 5<sup>th</sup> edition, New Age International(P) Limited Publishers, 2007.
3. NISE: *Control Systems Engineering*, 5<sup>th</sup> Edition, John wiley Publishers

### **REFERENCE BOOKS:**

1. Katsuhiko Ogata: *Modern Control Engineering*, 5<sup>th</sup> edition, Prentice Hall of India Pvt. Ltd., 2010.
2. Anand Kumar.A: *Control Systems*, Prentice Hall of India Pvt. Ltd.,
3. Narciso F. Macia George J. Thaler: "*Modelling & Control Of Dynamic Systems*", Thomson Publishers.

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(AUTONOMOUS)**

**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AEE18 SIGNALS & SYSTEMS**

**Objectives:**

1. To introduce theory to qualify and quantify signals and systems.
2. To provide basic groundwork for Digital Signal Processing.
3. To Comprehend this course with many other topics in electrical engineering field i.e. Circuits, Control Systems, Digital & Analog Electronics, Digital Signal Processing.

**Outcomes:**

After completion of this course Student will be able to:

1. Characterize discrete linear time invariant systems using time and frequency domain methods.
2. Apply Laplace Transform Techniques in formulating and solving engineering problems.

**UNIT I**

**SIGNAL ANALYSIS:** Analogy between vectors and signals - Orthogonal signal space - Signal approximation using orthogonal functions - Mean square error - closed or complete set of orthogonal functions - Orthogonality in complex functions - Exponential and sinusoidal signals - Concepts of impulse function - Unit step function - Signum function.

**UNIT II**

**FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS:** Representation of Fourier series - Continuous time periodic signals - Properties of Fourier series - Dirichlet's conditions - Trigonometric Fourier series and Exponentials Fourier series - Complex Fourier Spectrum.

**UNIT III**

**FOURIER TRANSFORMS:** Deriving Fourier Transform from Fourier series - Fourier transform of arbitrary signal - Fourier transform of standard signals - Fourier transform of periodic signals - Properties of Fourier transforms - Fourier transforms involving impulse function and Signum function - Introduction to Hilbert Transform.

**UNIT IV**

**SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:** Linear system - Impulse response - Response of a linear system - Linear time-invariant (LTI) system - Linear time variant (LTV) system - Transfer function of a LTI system - Filter characteristics of linear systems - Distortionless transmission through a system - Signal bandwidth - System bandwidth - Ideal LPF - HPF and BPF characteristics - Causality and Poly-Wiener criterion for physical realization - Relationship between bandwidth and rise time.

**UNIT V**

**SAMPLING:** Sampling theorem – Graphical and analytical proof for Band Limited signals - Impulse sampling - Natural and Flat top Sampling - Reconstruction of signal from its samples - Effect of under sampling – Aliasing - Introduction to Band pass sampling.

**UNIT VI**

**CONVOLUTION AND CORRELATION OF SIGNALS:** Concept of convolution in time domain and frequency domain - Graphical representation of convolution - Convolution property of Fourier transforms - cross correlation and auto correlation of functions - Properties of correlation function - Energy density spectrum - Parseval's theorem - Power density spectrum - Relation between auto correlation function and energy/power spectral density function - Relation between convolution and correlation - Detection of periodic

signals in the presence of noise by correlation - Extraction of signal from noise by filtering.

#### **UNIT VII**

**LAPLACE TRANSFORMS:** Review of Laplace Transforms (LT) - Partial fraction expansion - Inverse Laplace transform - Concept of region of convergence (ROC) for Laplace transforms - Constraints on ROC for various classes of signals - Properties of LT's, relation between LT's and FT of a signal - Laplace transform of certain signals using waveform synthesis.

#### **UNIT VIII**

**Z-TRANSFORMS:** Fundamental difference between continuous and discrete time signals - Discrete time signal representation using complex exponential and sinusoidal components - Periodicity of discrete time using complex exponential signal - Concept of z-transform of a discrete sequence - Distinction between Laplace - Fourier and z-transforms - Region of convergence in z-transform - Constraints on ROC for various classes of signals - Inverse z-transform - Properties of z-transforms.

#### **TEXT BOOKS:**

1. Lathi.B.P: *Signals, Systems & Communications*, BS Publications, 2009.
2. Oppenheim.A.V, Willsky.A.S and Nawab.S.H: *Signals and Systems*, 2<sup>nd</sup> Edition, PHI.
3. Simon Haykin and Van Veen: *Signals & Systems*, 2<sup>nd</sup> Edition, Wiley Publications.
4. A.V. Oppenheim and R.W. Schaffer, *Discrete Time Signal Processing*, 2<sup>nd</sup> ed., PHI.

#### **REFERENCE BOOKS:**

1. Ramakrishna Rao.A: *Signals and Systems*, TMH, 2008
2. Lathi.B.P: *Linear Systems and Signals*, 2<sup>nd</sup> Edition, Oxford University Press, 2008.
3. Michel J.Robert: *Fundamentals of Signals and Systems*, MGH International Edition, 2008.
4. Philips.C.L, Parr.J.M and Eve A.Riskin: *Signals, Systems and Transforms*, 3<sup>rd</sup> Edition, Pearson Education.

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**III B.Tech –I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**12AEC22 MICROPROCESSORS AND MICROCONTROLLERS  
(Common to ECE and EEE)**

**Objectives:**

1. To familiarize the architecture of 8086 processor, Assembly language programming and interfacing with various peripherals.
2. To provide the knowledge of 8051 microcontroller concepts, architecture and programming.
3. To understand and design microprocessor based systems for various applications.

**Outcomes:**

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

1. Study and understand the architecture and programming of any other microprocessor or microcontroller.
2. Do any type of VLSI, Embedded systems, Industrial and real time application.

**UNIT I**

**8086 MICRO PROCESSOR:** History of Microprocessors - Memory segmentation - 8086 Microprocessor: Architecture, special functions of general purpose registers, flag register and functions of flags, addressing modes and instruction set of 8086.

**UNIT II**

**ASSEMBLY LANGUAGE PROGRAMING:** Assembler directives - procedures and macros - Assembly language programs (8086) with assembler directives for addition, subtraction, multiplication, division, sorting, searching, bit manipulation, programs using look-up tables.

**UNIT III**

**INTERFACING MEMORY AND I/O PORTS:** Pin diagram of 8086-Minimum mode and maximum mode of operation - Timing diagrams for memory read(MR) - Memory write (MW) - IO read(IOR) and IO write(IOW) bus cycles - Interfacing memory (static RAM and ROM) - 8255 PPI - Various modes of operation and interfacing with 8086.

**UNIT IV**

**APPLICATIONS OF 8086 MICROPROCESOR:** ADC Interfacing - Multichannel data acquisition system - DAC interfacing - wave from generation - Traffic light controller - stepper motor control - Temperature measurement and control.

**UNIT V**

**PROGRAMABLE INTERFACING DEVICES:** Interrupt structure of 8086 - Interrupt vector table - 8259 PIC architecture and interfacing - Cascading of interrupt controllers and its importance – Need for DMA,DMA data transfer method - Interfacing 8257.

**UNIT VI**

**SERIAL DATA TRANSFER AND PROGRAMABLE INTERVAL TIMER:** Asynchronous and synchronous serial data transfer schemes - 8251 USART Architecture and interfacing - TTL to RS 232C and RS 232C to TTL conversion - Sample program of serial data transfer - Programmable interval timer 8253 - modes of 8253 and its Interfacing - Programming examples with 8253.

## **UNIT VII**

**8051 MICRO CONTROLLER:** Architecture – Registers - I/O ports and memory organization - Addressing Modes - instruction set, simple assembly language programming examples using 8051.

## **UNIT VIII**

**8051 INTERRUPTS, TIMER/COUNTER AND SERIAL COMMUNICATION:** Interrupts in 8051 - Initialization of interrupts - Interrupt priorities - Timer/Counter modes and applications with programming examples - Serial communication modes with programming examples - Important features of MCS-96 and ARM Microcontrollers.

### **TEXT BOOKS:**

1. A.K. Ray and K.M.Bhurchandi: *Advanced microprocessor and peripherals*, 2<sup>nd</sup> edition, TMH, 2000.
2. Deshmukh: *Microcontrollers*, Tata Mc-Graw Hill Edition, 2004.
3. Raj Kamal: *Microcontrollers Architecture, programming, interfacing and systems Design*, Pearson Education, 2005.

### **REFERENCE BOOKS:**

1. Douglas V.Hall: *Microprocessors interfacing*, 2<sup>nd</sup> edition, 2007.
2. Walter A.Triebel, Avtar Singh: *The 8088 and 8086 Microprocessors*, 4<sup>th</sup> Edition, PHI, 2003.
3. Liu and GA Gibson: *Micro computer systems 8086/8088 family Architecture programming and Design*, 2<sup>nd</sup> Edition, PHI.
4. Subrata Ghoshal: *8051 Microcontroller-internals instructions, programming and interfacing*, Pearson, 2010.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**12AEE19 ELECTRICAL MACHINES-II LAB**

**PART-A:**

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

1. OC and SC test on Single phase Transformer- Determination of equivalent circuit parameters and predetermination of efficiency and regulation.
2. Sumpner's Test on a pair of single phase transformers- Determination of efficiency.
3. Conversion of three-phase to two single phase supply using Scott connection of transformer.
4. No-load and Blocked Rotor tests on a three phase induction motor- Predetermination of performance curves by drawing circle diagram.
5. Load Test on Three-phase Induction Motor-Determination of performance curves.
6. OCC and SC tests on three phase alternator- predetermination of regulation and efficiency by EMF, MMF and Potier triangle methods.
7. No load and load tests on a three phase synchronous motor-Determination of V-Curves and  $\Lambda$  -curves.

**PART-B:**

**Any Three of the following experiments are required to be conducted:**

8. Determination of  $X_d$  and  $X_q$  on a salient pole synchronous machine.
9. Parallel operation of two single phase transformers.
10. No load and blocked rotor tests on single phase Induction Motor- Determination of equivalent circuit parameters.
11. Separation of core losses of a single phase transformer.
12. Heat run test on single phase transformer.

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**III B.Tech –I Semester EEE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-	-	<b>3</b>	<b>2</b>

**12AEE20 CONTROL SYSTEMS & SIMULATION LAB**

**PART-A:**

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

1. Time response of Second order system using P,PI & PID controller.
2. Transfer function of DC Motor using Armature voltage control and field control.
3. Characteristics of Synchros
4. Characteristics of AC servo motor
5. Effect of feedback on DC servo motor
6. Lag ,Lead & Lead- Lag compensation – Magnitude and phase plots
7. Simulation of Transfer function using OP-AMP

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
9. Time domain analysis of second order system-Determination of time domain specifications and steady state error using MATLAB.
10. State space model for classical transfer function using MATLAB – Verification.
11. Characteristics of magnetic amplifiers
12. Temperature controller using PID

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**12AEE21 POWER ELECTRONICS**

**Objectives:**

1. To understand the basic theory of power semiconductor switches such as power BJT, SCR, MOSFET, IGBT and their triggering mechanisms.
2. To understand the operation of single phase and three phase controlled rectifiers, choppers, AC voltage controllers, inverters and cycloconverters with R, RL and RLE loads and their applications.

**Outcomes:**

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

1. Gain the knowledge of power semiconductor devices which are used for control rectifiers, choppers, inverters and cycloconverters.
2. Acquire the knowledge to apply controlled converters which are used in variable speed AC and DC drive applications.

**UNIT I**

**POWER SEMICONDUCTOR DEVICES:** Thyristors – Silicon Controlled Rectifiers (SCR's) – Power MOSFET – Power IGBT and their characteristics - 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

**UNIT II**

**DEVICES AND COMMUTATION CIRCUITS:** Two transistor analogy – SCR – R, RC and UJT firing circuit – Series and parallel connections of SCR's – Snubber circuit – Specifications and Ratings of SCR's, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutation circuits.

**UNIT III**

**SINGLE PHASE HALF CONTROLLED CONVERTERS:** Phase control technique – Single phase Line commutated converters – Midpoint and Bridge connections – Half controlled converters with R, RL and RLC loads – Derivation of average load, voltage and current - Active and Reactive power inputs to the converters without and with Freewheeling Diode – Numerical problems.

**UNIT IV**

**SINGLE PHASE FULLY CONTROLLED CONVERTERS:** Fully controlled converters - Midpoint and Bridge connections with R, RL loads - 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 equations – Numerical problems.

**UNIT V**

**THREE PHASE LINE COMMUTATED CONVERTERS:** 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 VI**

**AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS:** 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 VII**

**CHOPPERS:** Time ratio control and Current limit control strategies – Types of Chopper Circuits - Step down & Step up choppers – AC Chopper - Derivation of load voltage and currents with R, RL and RLE loads - Step up Chopper – Load voltage Expression – Switch mode regulator – Buck and Boost.

#### **UNIT VIII**

**INVERTERS:** Single phase bridge Inverter – Single phase Half Bridge and Full Bridge configuration - Three phase Half Bridge and Full Bridge configuration - Voltage control techniques for inverters - Pulse Width Modulation Techniques – Sinusoidal PWM and space vector Delta Modulation - Numerical problems.

#### **TEXT BOOKS:**

1. Singh.M.D & Kanchandhani.K.B: *Power Electronics*, Tata Mc Graw – Hill Publishing company, 1998.
2. Rashid.M.H: *Power Electronics Circuits, Devices and Applications*, 2<sup>nd</sup> edition, Prentice Hall of India, 1998.
3. Sen.P.C: *Power Electronics*, Tata Mc Graw-Hill Publishing.

#### **REFERENCE BOOKS:**

1. Vedam Subramanyam: *Power Electronics*, 3<sup>rd</sup> Edition, New Age International (P) Limited.
2. Dubey.G.K, Doradla.S.R, Joshi.A and Sinha.R.M.K: *Thyristorised Power Controllers*, New Age International (P) Limited Publishers, 1996.
3. John G. Kassakian, Martin F. Schlecht and George C. Verghese: *Principles of Power Electronics*, Pearson.
4. Murthy.V.R: *Power Electronics*, 1<sup>st</sup> edition, OXFORD University Press, 2005.

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**12AHS12 MANAGEMENT SCIENCE  
(Common to EEE & ECE)**

**Objective:**

1. To provide an overview of management and its various principles to Engineering students to face the challenging of technology driven Industry.

**Outcome:**

After completion of this course students will be able to:

1. Apply to the Management functions & principles in the field of Engineering

**UNIT I**

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

**UNIT II**

**DESIGNING ORGANIZATIONAL STRUCTURES:** Basic concepts related to Organisation - Departmentation and Decentralisation - Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

**UNIT III**

**OPERATIONS MANAGEMENT:** Principles and Types of Plant Layout - Methods of production (Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement - Statistical Quality Control: chart, R chart, c chart, p chart, (simple Problems) - Acceptance Sampling - Deming's contribution to quality.

**UNIT IV**

**MATERIALS MANAGEMENT:** Objectives - Need for Inventory control - EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

**Marketing:** Functions of Marketing - Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution

**UNIT V**

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

**UNIT VI**

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

## **UNIT VII**

**STRATEGIC MANAGEMENT:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

## **UNIT VIII**

**CONTEMPORARY MANAGEMENT PRACTICES:** Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Supply Chain Management, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

### **TEXT BOOKS:**

1. Aryasri: *Management Science*, TMH, 2004.
2. Stoner, Freeman, Gilbert: *Management*, 6<sup>th</sup> Edition, Pearson Education, New Delhi, 2004.

### **REFERENCE BOOKS:**

1. Kotler Philip & Keller Kevin Lane: *Marketing Mangement* 12/e, PHI, 2005.
2. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich *Management—Principles and Guidelines*, Biztantra, 2003.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, *Personnel Management*, Himalaya, 25/e, 2005
6. Samuel C.Certo: *Modern Management*, 9/e, PHI, 2005
7. Schermerhorn, Capling, Poole & Wiesner: *Management*, Wiley, 2002.
8. Parnell: *Strategic Management*, Biztantra, 2003.
9. Lawrence R Jauch, R.Gupta &William F.Glueck: *Business Policy and Strategic Management*, Frank Bros., 2005.

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**12AEE22 SOFT COMPUTING TECHNIQUES**

**Objectives:**

1. To introduce the basic concepts of neural networks, Artificial Neural networks, Fuzzy Logic, Genetic Algorithm and essentials of Artificial Neural networks with single and Multi-Layer feed forward networks.
2. To impart knowledge about associate memory, fuzzy sets and fuzzy logic systems components Genetic Algorithms.
3. To study the applications of soft computing techniques in electrical systems.

**Outcomes:**

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

1. Understand design fundamentals of electrical systems using soft computing techniques
2. Develop Heuristic Control methods with model to Electrical systems.

**UNIT I**

**ARTIFICIAL NEURAL NETWORKS:** Introduction - Biological Neuron - Artificial Neuron - Basic concepts of Neural Networks - Basic Models of ANN Connections - McCulloch-Pitts Model - Characteristics of ANN - Applications of ANN.

**UNIT II**

**ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS:** Artificial Neuron Model - Operations of Artificial Neuron - Types of Neuron Activation Function - ANN Architectures - Classification Taxonomy of ANN - Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules - Types of Application

**UNIT III**

**SUPERVISED LEARNING NETWORKS:** Perceptron Network - Perceptron Learning Rule - Architecture - Perceptron Training Algorithm - ADALINE, MADALINE - Back Propagation Network - BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation - Radial Basis Function.

**UNIT IV**

**ASSOCIATIVE MEMORY NETWORK:** Training Algorithms for Pattern Association - Auto Associative Memory Network - Hetero Associative Memory Network - BAM - Hopfield Networks.

**UNIT V**

**CLASSICAL & FUZZY SETS:** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

**UNIT VI**

**FUZZY LOGIC SYSTEM COMPONENTS:** Fuzzification - Membership value assignment - Development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

**UNIT VII**

**GENETIC ALGORITHMS:** Introduction - Basic Operators and Terminologies in GA - Traditional Vs Genetic Algorithm - Encoding, Fitness Function, Reproduction, Crossover, Mutation Operator.

## **UNIT VIII**

**APPLICATIONS TO ELECTRICAL SYSTEMS:** ANN based Short term Load Forecasting - Load flow Studies - Fuzzy logic based Unit Commitment and Genetic Algorithm based Economic Dispatch.

### **TEXT BOOKS:**

1. Sivanandam.S.N and Deepa.S.N: *Principles of – Soft Computing*, Wiley India.
2. Rajasekharan and Pai: *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and Applications*, PHI Publications.
3. Satish Kumar: *Neural networks*, TMH, 2004.
4. Jang.J.S.R, Sun.C.T and Mizutani.E: *Neuro Fuzzy and Soft Computing*, Pearson Education.

### **REFERENCE BOOKS:**

1. James A Freeman and Davis Skapura: *Neural Networks*, Pearson Education, 2002.
2. Simon Hakins: *Neural Networks*, Pearson Education
3. T. J. Ross: *Fuzzy Logic with Engineering Applications*, 2<sup>nd</sup> Edition , Wiley India.
4. Bart Kosko: *Neural Networks and Fuzzy Logic System*, PHI Publications.
5. Goldberg.D.E: *Genetic Algorithms*, Addison Wisley,1999.

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**12AEC28 DIGITAL SIGNAL PROCESSING  
(Common to ECE and EEE)**

**Objectives:**

1. To have an over view of discrete time signals and systems.
2. To familiarize DFT and FFT computations.
3. To design and realize various types of IIR and FIR filters.

**Outcomes:**

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

1. Analyze and process signals in the discrete time domain.
2. Design digital filters to suit specific requirements for specified applications

**UNIT-I**

**INTRODUCTION**

Introduction to digital signal processing: Discrete time signals -sequences, Elementary discrete time signals, Basic operations on sequences, classification of discrete time signals, classification of discrete time systems-static and dynamic,causal and non causal,linear and nonlinear, shift invariant and shift variant,stable and unstable systems;impulse response and linear convolution,condition for BIBO stability,Linear constant coefficient difference equation.

**UNIT-II**

**DISCRETE FOURIER SERIES AND DISCRETE FOURIER TRANSFORM**

Discrete Fourier Series(DFS) representation of periodic sequences, Discrete Fourier Transforms(DFT): DFT and IDFT,Properties of DFT,Computation of DFT and IDFT,circular convolution,Linear convolution using circular convolution,overlap-add and overlap-save methods for long sequences.

**UNIT-III**

**FAST FOURIER TRANSFORMS**

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N.

**UNIT –IV**

**APPLICATIONS OF Z-TRANSFORMS**

Review of Z-transforms,System function  $H(z)$ ,Stability analysis,Solution of difference equations using z-transforms-Natural response, Forced response and total response.Deconvolution using z-transform. Frquency spectrum of discrete time signals and systems,Relation between DFT and z-transform.

**UNIT-V**

**REALIZATION OF DIGITAL FILTERS**

IIR Filter structures: Direct form-I realization, Direct form-II realization, Transposed direct forms,Cascade form structure and parallel form structure.

FIR Filter structures: Direct form, Transposed form and cascade form structures. Minimum multiplier structure for linear phase FIR filters.

**UNIT-VI**

**IIR DIGITAL FILTERS**

Analog filter approximations-Butterworth and Chebyshev(Type-I), Analog to analog transformation to transform low pass to high pass,bandpass and bandstop filters,

Design of IIR filters from analog filters: Backward difference method, Impulse invariant technique and Bilinear transformation. Illustrative Problems.

### **UNIT-VII**

#### **FIR DIGITAL FILTERS**

Characteristics of FIR digital filters, Design of FIR digital Filters: Fourier series method, Frequency Sampling technique, Windowing methods-Rectangular Window, Blackmann window, Bartlett window, Raised cosine window, Hamming window, Hanning window, Illustrative problems, comparison of IIR and FIR Filters.

### **UNIT-VIII**

#### **MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS:**

Basic sample rate alteration devices, Multirate Structures for sampling rate Converters, Multistage design of decimator and Interpolator, Polyphase Decomposition. Applications of Digital signal Processing.

#### **TEXT BOOKS:**

1. John G. Proakis & Dimitris G. Manolakis, Digital signal processing, Principles, Algorithms and Applications, Pearson Education/PHI, 4th ed., 2007.
2. Sanjit K Mitra, Digital Signal Processing, A computer base approach, Tata Mcgraw Hill, 3<sup>rd</sup> edition, 2009.
3. A.V. Oppenheim and R.W. Schaffer, Discrete Time Signal Processing, 2<sup>nd</sup> ed., PHI.
4. A.Anand Kumar, Digital Signal Processing, PHI Learning Private Limited, 2013.

#### **REFERENCES:**

1. Andreas Antoniou, Digital Signal Processing, TATA McGraw Hill, 2006.
2. R S Kaler, M Kulkarni, & Umesh Gupta, A Text book on Digital Signal Processing, I K International Publishing House Pvt. Ltd.
3. M. H. Hayes, Digital Signal Processing, Schaum's Outlines, TATA Mc-Graw Hill, 2007.

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**12AEE23 SWITCH GEAR & PROTECTION**

**Objectives:**

1. To introduce various types of CB's and Relays for protection of generators, transformers and feeder bus bars from short circuits and other hazards.
2. To deal with microprocessor relays.

**Outcomes:**

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

1. Provide switch gear protection for healthy power system operation and control.
2. Understand the performance and design of protective systems.

**UNIT I**

**CIRCUIT BREAKERS-1:** Circuit Breakers: Elementary principles of arc interruption - Restriking Voltage and Recovery voltage - Restriking Phenomenon - Average and Maximum RRRV - Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications - Types and Numerical Problems - Auto Reclosures.

**UNIT II**

**CIRCUIT BREAKERS-2:** Description and Operation of following types of circuit breakers - Minimum Oil Circuit breakers - Air Blast Circuit Breakers - Vacuum and SF<sub>6</sub> circuit breakers.

**UNIT III**

**ELECTROMAGNETIC RELAYS:** Basic Requirements of Relays - Primary and Backup protection - Construction details - Attracted armature, balanced beam, Induction type and Differential type relays - Universal Torque equation - Characteristics of over current - Directional and Distance relays.

**UNIT IV**

**STATIC AND MICROPROCESSOR BASED RELAYS:** Static Relays - Advantages and Disadvantages - Definite time, Inverse and IDMT static relays - Comparators - Amplitude and Phase comparators - Microprocessor based relays - Advantages and Disadvantages - Block diagram for over current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts.

**UNIT V**

**GENERATOR PROTECTION:** Protection of generators against Stator faults, Rotor faults and abnormal Conditions - Restricted Earth fault and Inter-turn fault Protection - Numerical Problems on Percentage Winding Unprotected.

**UNIT VI**

**TRANSFORMER PROTECTION:** Protection of transformers - Percentage Differential Protection - Numerical Problem on Design of CT s Ratio - Buchholtz relay Protection.

**UNIT VII**

**PROTECTION OF FEEDERS AND TRANSMISSION LINES:** Protection of Feeder (Radial & Ring main) using over current Relays - Protection of Transmission line 3-Zone protection using Distance Relays - Carrier current protection - Protection of Bus bars.

## **UNIT VIII**

**PROTECTION AGAINST OVER VOLTAGES:** Generation of Over Voltages in Power Systems  
- Protection against Lightning Over Voltages – Types of Lightning Arresters - Insulation  
Coordination – BIL.

### **TEXT BOOKS:**

1. Sunil S Rao: *Switchgear and Protection*, Khanna Publishers
2. Badari Ram, Viswakarma.D.N: *Power System Protection and Switchgear*, TMH Publications.
3. Paithankar.Y.G and Bhide.S.R: *Fundamentals of Power System Protection*, 2<sup>nd</sup> Edition, PHI.

### **REFERENCE BOOKS:**

1. Paithankar.Y.G: *Transmission network Protection*, Taylor and Francis,2009.
2. Bhuvanesh Oza: *Power system protection and switch gear*, TMH, 2010.
3. Wadhwa.C.L: *Electrical Power Systems*, 3<sup>rd</sup> edition, New Age international (P) Limited.
4. Christopoulos.C and Wright.A: *Electrical power System Protection*, 2<sup>nd</sup> Edition, Springer.

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**12AEE24 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**

**Objectives:**

1. To introduce the basic principles of all electrical and Electronic Measuring instruments
2. To develop the knowledge about instrument transformer, power factor meter, energy meters and potentiometers.
3. To introduce magnetic measurements, measurement of RLC parameters, transducers and their applications, measurements of non-electrical quantities.

**Outcomes:**

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

1. Develop an understanding of all electrical measuring instruments and compensation techniques.
2. Implement the DC and AC bridges and transducers for the measurement of electrical quantities in various domestic and industrial applications.

**UNIT I**

**MEASURING INSTRUMENTS:** Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, Dynamometer, moving iron type instruments – Expression for the deflecting torque and control torque – Errors and compensation – Extension of range using shunt and series resistance.

**UNIT II**

**INSTRUMENT TRANSFORMERS AND P.F METER:** CT and PT – Ratio and phase angle errors – Design considerations - Types of PF Meters – Dynamometer and moving iron type – 1- $\Phi$  and 3- $\Phi$  meters.

**UNIT III**

**MEASUREMENT OF POWER / ENERGY:** Single phase dynamometer wattmeter - LPF and UPF - Double element and three element Dynamometer wattmeter - Expression for Deflecting and control torques - Single phase Induction type Energy Meter – Driving and Braking torques – Errors and compensation - Three phase energy meter.

**UNIT IV**

**POTENTIOMETERS:** Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage, A.C. Potentiometers: Polar and coordinate types - Standardization – Applications.

**UNIT V**

**D.C & A.C BRIDGES:** Method of measuring low, medium and high resistances – Sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, Measurement of high resistance – Loss of charge method - measurement of inductance - Maxwell's bridge, Anderson's bridge - Measurement of capacitance and loss angle - Desauty bridge - Wein's bridge – Schering Bridge.

**UNIT VI**

**MAGNETIC MEASUREMENTS:** Ballistic galvanometer – Equation of motion – Flux meter – Constructional details - Comparison with Ballistic Galvanometer - Determination of B-H Loop - Method of reversals - Six point method - A.C. testing – Iron loss of bar samples.

## **UNIT VII**

**TRANSDUCERS:** Definition of transducer - Classification of transducers - Advantages of Electrical transducers - Characteristics and choice of transducers - Principle operation of resistor, inductor, LVDT and capacitor transducers - LVDT Applications - Strain gauge - Principle of operation - gauge factor - Thermistors - Thermocouples - Synchros, Piezo electric transducers - photovoltaic - photo conductive cells, photo diodes - Hall effect - Current and voltage sensors.

## **UNIT VIII**

**MEASUREMENT OF NON-ELECTRICAL QUANTITIES:** Measurement of strain - Gauge Sensitivity - Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow, Liquid level

### **TEXT BOOKS:**

1. Sawhney.A.K: *Electrical & Electronic Measurement & Instruments*, Dhanpat Rai & Co. Publications.
2. Murthy.D.V.S: *Transducers and Instrumentation*, Prentice – Hall of India
3. Golding.E.W and Widdis.F.C: *Electrical Measurements and Instrumentation*, 5<sup>th</sup> Edition, Reem Publications.

### **REFERENCE BOOKS:**

1. Buckingham and Price: *Electrical Measurements*, Prentice Hall of India
2. Reissland.M.U: *Electrical Measurements: Fundamentals, Concepts, Applications*, New Age International (P) Limited, Publishers.
3. Morris.A.S: *Principles of Measurement and Instrumentation*, Pearson/Prentice – Hall of India

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**12AEE25 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB**

**PART-A:**

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

1. D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
2. Measurement of % ratio error and phase angle error of given C.T by comparison.
3. Resistance strain gauge and LVDT- Calibration and measurement of Resistance & Capacitance.
4. Calibration LPF wattmeter – by Phantom testing.
5. Kelvin’s double Bridge & Wheat stone’s bridge - Measurement of low & medium resistance.
6. Schering bridge & Anderson bridge-Measurement of capacitance & inductance.
7. Measurement of 3 phase power using Two watt meter method (Balanced).

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Characteristics of Thermistor, Thermo couple and Piezo Electric Transducers
9. Calibration of dynamometer power factor meter.
10. Polar curve using LUX meter- Measurement of intensity of illumination.
11. Dielectric oil testing using H.T. testing Kit.
12. Measurement of 3 phase reactive power with single-phase wattmeter.

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**12AEC31 MICROPROCESSOR AND MICROCONTROLLERS LAB  
(Common to ECE and EEE)**

**PART-A:**

**Any Eight of the following experiments are required to be conducted:**

**MICROPROCESSORS:**

1. ALPs (8086) for addition and subtraction
2. ALPs (8086) for multiplication and Division
3. ALPs (8086) for sorting and searching
4. (a)ALPs (8086) for square wave and rectangular wave generation using 8255 in I/O mode and BSR modes.  
(b)ALPs (8086) for (I) Rate of generation and (II) square wave generation using 8253 timer.
5. ALPs(8086) for ADC and DAC interfacing boards and drawing output Vs input characteristics.
6. ALPs (8086) for generating ramp wave, triangular wave, stair case wave forms using DAC
7. ALP (8086) for pattern generation using dual DAC interfacing bound.
8. ALP (8086) for traffic light controller
9. ALP (8086) for stepper motor control
10. ALP(8086) for temperature measurement

**PART-B:**

**Any Four of the following experiments are required to be conducted:**

**MICRO CONTROLLERS:**

11. ALP (8051) to determine the largest and smallest of N bytes.
12. (a) ALP(8051) to multiply a 16-bit number by an 8-bit number  
(b) ALP(8051) to find square root of an 8-bit number
13. (a) ALP (8051) to determine LCM of two 8- bit numbers  
(b) ALP (8051) to determine GCD of two 8- bit numbers
14. Timer/Counters (8051) in different modes.
15. 8051 Serial communication modes.

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**12AEE26 SEMINAR**

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**IV B.Tech –I Semester EEE**

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**12AEE27 POWER SYSTEM ANALYSIS**

**Objectives:**

1. To Study and Formulate of Y bus and Z Bus of a power system and power flow studies by various methods.
2. Model the power system under steady state operating conditions and analysis of the power systems under abnormal (or) Fault conditions.
3. To understand and analyze the transient behavior of power system when it is subjected to a fault.

**Outcomes:**

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

1. Understand Power system analysis and be familiar with the modeling of power systems and its components.
2. Apply different methods to analyze power system for system planning and operation.

**UNIT I**

**POWER SYSTEM NETWORK MATRICES-I:** Representation of Power system elements - Essential characteristics of Algorithm - Steps involved in solving a problem using Digital computer - Graph Theory: Definitions, Bus Incidence Matrix -  $Y_{bus}$  formation by Direct and Singular Transformation Methods - Numerical Problems.

**UNIT II**

**POWER SYSTEM NETWORK MATRICES-II:** Formation of  $Z_{Bus}$  - Partial network, Algorithm for the Modification of  $Z_{Bus}$  Matrix for addition element for different cases: a new bus to reference, a new bus to an old bus, an old bus to reference bus and between two old buses (Derivations and Numerical Problems) - Modification of  $Z_{Bus}$  for the changes in network ( Problems )

**UNIT III**

**POWER FLOW STUDIES-I:** Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart - Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses) - Determination of Bus Voltages - Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

**UNIT IV**

**POWER FLOW STUDIES-II:** Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Buses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods - Comparison of Different Methods – DC load Flow

**UNIT V**

**SHORT CIRCUIT ANALYSIS-I:** Per unit System of Representation – Per unit equivalent reactance network of a three phase Power System - Numerical Problems - Symmetrical fault Analysis - Short Circuit Current and MVA Calculations - Fault levels, Application of Series Reactors - Numerical Problems.

**UNIT VI**

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

## **UNIT VII**

**POWER SYSTEM STEADY STATE STABILITY ANALYSIS:** Elementary concepts of Steady State - Dynamic and Transient Stabilities - Description of Steady State Stability Power Limit - Transfer Reactance - Synchronizing Power Coefficient - Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability.

## **UNIT VIII**

**POWER SYSTEM TRANSIENT STATE STABILITY ANALYSIS:** Derivation of Swing Equation - Determination of Transient Stability by Equal Area Criterion - Application of Equal Area Criterion - Critical Clearing Angle Calculation - Solution of Swing equation by 4<sup>th</sup> order Range-Kutta Method (up to 2 iterations) - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

### **TEXT BOOKS:**

1. Stagg El – Abiad & Stags: *Computer Methods in Power Systems*, Mc Graw-hill.
2. Nagrath.I.J & Kothari.D.P: *Modern Power system Analysis*, 2<sup>nd</sup> edition, Tata McGraw-Hill Publishing Company.
3. Nagsarkar and Sukhija: *Power System Analysis*, OXFORD University Press.

### **REFERENCE BOOKS:**

1. Grainger and Stevenson: *Power System Analysis*, Tata McGraw Hill.
2. Pai.M.A: *Computer Techniques in Power System Analysis*, Second Edition, TMH.
3. Gupta.B.R: *Power System Analysis and Design*, 6<sup>th</sup> Revised Edition, S. Chand & Co, 2010.
4. Arrillaga.J and Watson.N.R: *Computer Modeling of Electrical Power Systems*, John Wiley Student Edition, 2/e.
5. Uma Rao.K: *Computer Techniques and Models in Power Systems*, I. K. International.
6. Nasar.S.A, Schaum's Outline Series: *Electric Power Systems*, Revised 1<sup>st</sup> Edition, TMH.
7. Glover and Sarma: *Power System Analysis*, Thomson Publishers.

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**12AEE28 POWER SEMICONDUCTOR DRIVES**

**Objectives:**

1. To understand Modern Electric Drives Controlled by power electronic Converters.
2. To Select relevant type of drive for a given application.

**Outcomes:**

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

1. Acquire the knowledge about different controlling methods of DC and AC drives used in industry and domestic appliances.
2. Identify Suitable drive for specific application.

**UNIT I**

**CONTROL OF DC MOTORS BY SINGLE PHASE CONVERTERS:** Introduction to Thyristor controlled Drives - Single Phase semi and Fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed-Torque Characteristics - Problems on Converter fed DC motors.

**UNIT II**

**CONTROL OF DC MOTORS BY THREE PHASE CONVERTERS:** Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed-Torque characteristics – Problems.

**UNIT III**

**FOUR QUADRANT OPERATION OF DC DRIVES:** Introduction to Four quadrant operation – Motoring operations, Electric Braking, Plugging, Dynamic and Regenerative Braking operations - Four quadrant operation of DC motors by dual converters – Closed loop operation of DC motor (Block Diagram Only)

**UNIT IV**

**CONTROL OF DC MOTORS BY CHOPPERS:** Single quadrant, Two quadrant and four quadrant chopper fed DC separately excited and series excited motors – Continuous current operation – Output voltage and current wave forms – Speed torque expressions – speed torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation ( Block Diagram Only)

**UNIT V**

**CONTROL OF INDUCTION MOTOR THROUGH STATOR VOLTAGE:** Variable voltage characteristics - Control of Induction Motor by AC Voltage Controllers – Waveforms – speed torque characteristics.

**UNIT VI**

**CONTROL OF INDUCTION MOTOR THROUGH STATOR FREQUENCY:** Variable frequency characteristics - Variable frequency control of induction motor by Voltage source and current source inverter and Cyclo converters - PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – Numerical Problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

## **UNIT VII**

**CONTROL OF INDUCTION MOTOR FROM ROTOR SIDE:** Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive, performance and speed torque characteristics – Advantages - Applications – Numerical problems

## **UNIT VIII**

**CONTROL OF SYNCHRONOUS MOTORS:** Separate control & self control of synchronous motors – Operation of self controlled synchronous motors by VSI and CSI cycloconverters - Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only).

### **TEXT BOOKS:**

1. Dubey.G .K: *Fundamentals of Electric Drives*, Narosa Publications.
2. Rashid.M.H: *Power Electronic Circuits, Devices and applications*, PHI.

### **REFERENCE BOOKS:**

1. Singh. M.D and Khanchandani.K.B: *Power Electronics*, Tata McGraw-Hill Publishing company, 1998
2. Bose.B.K: *Modern Power Electronics and AC Drives*, PHI Publishers.
3. Vedam Subramanyam: *Thyristor Control of Electric drives*, Tata McGraw Hill Publications.
3. Pillai.S.K: *Analysis of Thyristor Power – conditioned motors*, 1<sup>st</sup> Edition, Universities press.

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**12AEE29 POWER SYSTEM OPERATION AND CONTROL**

**Objectives:**

1. To get an overview of Economic operation of power system and control.
2. To study the optimal scheduling of hydrothermal system, modeling of Turbine, Governor and design of load frequency controller.
3. To understand the concepts related to reactive power control, compensation techniques and fundamentals of power systems restructuring.

**Outcomes:**

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

1. Understand the economic operation of power systems, optimal scheduling, load frequency control, concept of reactive power control and compensation techniques
2. Know the need for Regulation, power system restructuring and key issues in regulation and deregulation.

**UNIT I**

**ECONOMIC OPERATION OF POWER SYSTEMS-I:** Optimal operation of Generators in Thermal Power Stations - Heat rate curve – cost curve – Incremental fuel and Production costs, Input-Output characteristics, Optimum generation allocation with line losses neglected.

**UNIT II**

**ECONOMIC OPERATION OF POWER SYSTEMS-II:** Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

**UNIT III**

**HYDROTHERMAL SCHEDULING:** Optimal scheduling of Hydrothermal System - Hydroelectric power plant models - Scheduling problems - Short term and Long term Hydrothermal scheduling problem.

**UNIT IV**

**MODELING OF TURBINE AND GOVERNOR:** Modeling of Turbine - First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models - Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of small signal transfer function – Block Diagram.

**UNIT V**

**LOAD FREQUENCY CONTROL – I:** Necessity of keeping frequency constant - Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.

**UNIT VI**

**LOAD FREQUENCY CONTROL – II:** Proportional plus Integral control of single area and its block diagram representation - steady state response – Load Frequency Control and Economic dispatch control - Load frequency control of two Area system – uncontrolled case and controlled case, tie-line bias control.

**UNIT VII**

**REACTIVE POWER CONTROL:** Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems - load compensation –

Specifications of load compensator - Uncompensated and compensated transmission lines - shunt and Series Compensation.

### **UNIT VIII**

**POWER SYSTEM RESTRUCTURING:** Introduction – Need for Regulation – Motivation for Power System Restructuring – Key issues in Deregulation.

#### **TEXT BOOKS:**

1. Chakravarthi.A and Halder.S: *Power System Operation and Control*, 3<sup>rd</sup> Edition, PHI.
2. Nagrath.I.J & Kothari.D.P: *Modern Power System Analysis*, 2<sup>nd</sup> edition, Tata M Graw – Hill Publishing Company Ltd.
3. Singh.S.N: *Electric Power Generation, Transmission and Distribution*, 2<sup>nd</sup> Edition, PHI.
4. Elgerd.O.I: *Electric Energy Systems*, Mc Graw-hill Edition.

#### **REFERENCE BOOKS:**

1. Duncan Glover.J and Sarma.M.S: *Power System Analysis and Design*, 3<sup>rd</sup> Edition.
2. Nasar.S.A: *Electric Power Systems*, Revised 1<sup>st</sup> Edition, Schaum's Outline Series TMH.
3. Abhijit Chakrabarti, Kothari.D.P, Mukhopadhyay.A.K and Abhinandan De: *An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems*, Eastern Economy Edition, 2010.

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**12AEE30 DESIGN OF ELECTRICAL SYSTEMS**

**Objectives:**

1. To understand design aspects of electrical system parameters, electrical installations in domestic building and industrial installations.
2. To impart knowledge in improvement of power factor, using compensation techniques and earthing system.
3. To understand power quality issues, resonance problems and energy economics in system design.

**Outcomes:**

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

1. Design industrial and domestic electrical installations.
2. Gain knowledge in power quality issues, Earthing and energy economics.

**UNIT I**

**DESIGN ASPECTS OF ELECTRICAL SYSTEMS:** Role of Statutes in Electrical System Design - Classification of Building Services - Design Aspects of Lighting - Design Aspects of Ventilation - Design Aspects of Climate Control - Design Aspects of Vertical Transportation - Design Aspects of Minor Building Services.

**UNIT II**

**ELECTRICAL INSTALLATIONS IN DOMESTIC BUILDINGS:** Classification - Estimation of Load Requirements - Selection of Type of Wiring - Special Features Applicable for High - Rise Apartment Buildings - Pre-commissioning Tests.

**UNIT III**

**INDUSTRIAL INSTALLATIONS – I:** Classification of Industrial Installation - General Characteristics - Selection of Distribution Architecture - Selection of Transformers and Sub Stations.

**UNIT IV**

**INDUSTRIAL INSTALLATIONS – II:** Short Circuit Studies - Fault Current Calculations - Earthing Design - Selection of Switch Gears - Electrical Protection, Protection of Circuit Elements, Persons & Life stack, Equipment, Electrical Isolation, Switch Gear Control, Switching Devices, Uses, Selective Co-ordination, Circuit Breakers and their Selection.

**UNIT V**

**POWER FACTOR IMPROVEMENT:** Nature of Reactive Energy - Power Factor, How to Improve Power Factor? - Economics of Power Factor Improvement - Location of Capacitors - Installation Precautions - Optimal Compensation - PF Correction of Induction Motors - Protection and Control, Voltage Transients, Switching Considerations.

**UNIT VI**

**POWER SYSTEM EARTHING:** Introduction – Earthing - Types of System Earthing - Reasons for Grounding/ Earthing - TN System, TT System, IT System, Protective Measures and Protective Devices in IT System - Main Characteristics of Earthing Systems - Selection Criteria for Earthing - Design Considerations of Earthing - Measurement of Earth Resistance - Earth Leakage Protection - Neutral Earthing for Generators and Transformers.

**UNIT VII**

**POWER QUALITY ISSUES AND RESONANCE PROBLEMS IN SYSTEMS DESIGN:** Power Quality Issues - Harmonics, Sources of Harmonics - Disturbances Caused by Harmonics - Methods to reduce the Impact of Harmonics - Design the Detuned Capacitor Bank - IEEE Standard 519-1992 and Limits.

#### **UNIT VIII**

**ENERGY ECONOMICS IN SYSTEM DESIGN:** Introduction - Time Value of Money - Single Payment Compound Amount Model (SPCA) - Uniform Series Compound Amount Model (USCA) - Uniform Series Present Worth Model (USPW) - Depreciation, Tax Considerations - After Tax Analysis.

#### **TEXT BOOKS:**

1. Giridharan.M.K: *Electrical Systems Design*, I. K. International Publishing House Pvt. Ltd.
2. Er. V. K. Jain and Er. Amitabh Bajaj: *Design of Electrical Installations*, University Science Press.

#### **REFERENCE BOOKS:**

1. Turangonen: *Electrical Distribution System*,

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**12AEE31 HVDC TRANSMISSION  
(Elective-I)**

**Objectives:**

1. To study the importance of HVDC transmission, analysis of HVDC converters, faults and protections, harmonics and filters.
2. To study reactive power control and power factor improvements of the systems and harmonics reduction techniques.

**Outcomes:**

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

1. Acquire knowledge about power electronic converters, which are widely used in HVDC transmission systems.
2. Know all the control parameters, harmonic reduction techniques and filter design, and optimize the control in HVDC transmission.

**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 DC 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 and their performance.

**UNIT III**

**CONVERTER & HVDC SYSTEM CONTROL:** Principle 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.

**UNIT IV**

**REACTIVE POWER CONTROL IN HVDC:** Reactive Power Requirements in steady state - Conventional control strategies - Alternate control strategies - Sources of reactive power - AC Filters – shunt capacitors - Synchronous condensers.

**UNIT V**

**POWER FLOW ANALYSIS IN AC/DC SYSTEMS:** Modeling of DC Links - DC Network - DC Converter - Controller Equations - Solution of DC load flow – P.U System for DC quantities - solution of AC-DC Power flow - Simultaneous method - Sequential method.

**UNIT VI**

**CONVERTER FAULT & PROTECTION:** Converter faults – Protection against over current and over voltage in converter station – surge arresters – smoothing reactors – DC breakers – Audible noise-space charge field - Corona effects on DC lines - Radio interference.

**UNIT VII**

**HARMONICS:** Generation of Harmonics – Characteristics harmonics, calculation of AC Harmonics, Non- Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics.

**UNIT VIII**

**FILTERS:** Types of AC filters - Design of Single tuned filters – Design of High pass filters.

**TEXT BOOKS:**

1. Padiyar.K.R: *HVDC Power Transmission Systems: Technology and system Interactions*, New Age International (P) Limited, and Publishers.
2. Sunil S.Rao: *EHVAC and HVDC Transmission Engineering and Practice*.

**REFERENCE BOOKS:**

1. Arrillaga.J: *HVDC Transmission*.
2. Kimbark.E.W: *Direct Current Transmission*, John Wiley & Sons.
3. Uhlmann.E: *Power Transmission by Direct Current*, B.S.Publications

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**12AEE32 DISTRIBUTION OF ELECTRIC POWER & SMART GRID TECHNOLOGY  
(Elective-I)**

**Objectives:**

1. To introduce the overall distribution network systems, design and methods of load forecasting.
2. To acquire knowledge about distribution transformer, substation, and Protective equipment.
3. To acquire the basics of smart grid technology and smart grid technology and controllers.

**Outcomes:**

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

1. Design the necessary accessories for distribution network.
2. Understand and design new emerging technologies pertaining to smart grid.

**UNIT I**

**DISTRIBUTION SYSTEM PLANNING:** Planning and forecasting techniques - load characteristics - Definitions - Load forecasting - Load management - Tariffs - Types of Distribution Transformers.

**UNIT II**

**DISTRIBUTION TRANSFORMER:** Single phase and Three phase transformers - Y/ $\Delta$  and  $\Delta$ /Y connections - Dry type and Self protected type transformers - Regulation and Efficiency.

**UNIT III**

**DISTRIBUTION SUB STATIONS:** Distribution sub-stations - Substation location and rating - Primary systems and installation - Bus schemes Sub transmission lines

**UNIT IV**

**SUBSTATION PROTECTION AND AUTOMATION:** Voltage drop and power loss calculations - Capacitors in distribution systems - Distribution system protection - Distribution system automation - Grounding.

**UNIT V**

**POWER QUALITY:** Introduction - Power quality and voltage quality - Terms and definitions, Transients, Long and short-duration voltage variations - Voltage sags and interruption sources - Transient over voltages - Capacitor Placement.

**UNIT VI**

**SMART GRID TECHNOLOGY:** Introduction to Smart Grid - Smart Grid Functions - Advantages - Indian Smart Grid - Key Challenges for Smart Grid - Smart Grid Architecture - Components and Architecture of Smart Grid Design.

**UNIT VII**

**SMART GRID TECHNIQUES - I:** Transmission, Distribution and Automation - Computational Intelligence Techniques - Distribution, Generation Technologies - Renewable Energy Technologies - Concept of Micro grids.

## **UNIT VIII**

**SMART GRID TECHNIQUES - II:** Electric Vehicles and plug-in hybrids - Environmental - Synchro Phasor Measurement Units (SPMUs) - Wide Area Measurement Systems (WAMS) - Control of Smart Power Grid System - Case study.

### **TEXT BOOKS:**

1. Dugan Roger C, Surya Mc Granaghan, Marks F. Beaty and H. Wayre: *Electrical Power Systems Quality*, 3rd Edition, TMH Publishers, 2012.
2. Turan Gonen: *Electric Power Distribution System Engineering*, 2nd Edition, BS Publications, 2007
3. Gil Masters: *Renewable and Efficient Electric Power System*, Wiley-IEEE Press, 2004.

### **REFERENCES BOOKS:**

1. Pabla A.S: *Electric Power Distribution Systems*, 4th Edition, TMH, 2006.
2. A.G. Phadke and J.S: Thorp, *Synchronized Phasor Measurements and their Applications*, Springer, 2008.
3. T. Ackermann: *Wind Power in Power Systems*, 2nd Edition, John Wiley & Sons, 2012.

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**12AEE33 EHV AC TRANSMISSION  
(Elective-I)**

**Objectives:**

1. To study the preliminary aspects of EHV AC transmission.
2. The basics of line and ground reactive parameters, voltage gradients of conductors, corona effects, and electrostatic field.
3. To understand the concepts of travelling wave theory and voltage control with compensation techniques.

**Outcomes:**

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

1. Know the necessity of EHV AC transmission and its parameters.
2. Understand the concept of Corona and its effect on transmission line and travelling wave theory phenomenon.
3. Know the compensation techniques to improve the voltage control.

**UNIT I**

**PRELIMINARIES:** Necessity of EHV AC transmission – Advantages and problems – power handling capacity and line losses - Mechanical considerations – Resistance of conductors – properties of bundled conductors – Bundle spacing and bundle radius - Examples.

**UNIT II**

**LINE AND GROUND REACTIVE PARAMETERS:** Line Inductance and capacitances – sequence Inductances and Capacitances – Modes of propagation – Ground return - Examples

**UNIT III**

**VOLTAGE GRADIENTS OF CONDUCTORS:** Electrostatics – Field of sphere gap – Field of line charges and properties – Charge – Potential relations for multi-conductors – surface voltage gradient on conductors – Distribution of voltage gradient on sub-conductors of Bundle – Examples.

**UNIT IV**

**CORONA EFFECTS – I:** Power loss and audible noise (AN) – corona loss formulae – charge voltage diagram – Generation, characteristics - Limits and measurements of AN – Relation between 1 $\Phi$  and 3 $\Phi$  AN levels – Examples.

**UNIT V**

**CORONA EFFECTS – II:** Radio interference (RI) - Corona pulses generation, properties, limits – Frequency spectrum – Modes of propagation – Excitation function – Measurement of RI, RIV and Excitation functions – Examples.

**UNIT VI**

**ELECTRO STATIC FIELD:** Electrostatic field - Calculation of electrostatic field of EHV/AC lines – Effect on humans, animals and plants – Electrostatic induction in unenergised circuit of double - Circuit line – Electromagnetic interference - Examples.

**UNIT VII**

**TRAVELING WAVE THEORY:** Traveling wave expression and solution - Source of excitation - Terminal conditions - Open circuited and short-circuited, end-reflection and refraction coefficients - Lumped parameters of distributed lines - Generalized constants - No load voltage conditions and charging current.

## **UNIT VIII**

**VOLTAGE CONTROL:** Power circle diagram and its use – voltage control using synchronous condensers – Cascade connection of shunt and series compensation – sub synchronous resonance in series capacitor – compensated lines – static VAR compensating system.

### **TEXT BOOKS:**

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

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**12AEE34 ADVANCED CONTROL SYSTEMS  
(Elective-II)**

**Objectives:**

1. To study the state space analysis which includes canonical forms, solution of state equations, feedback control systems and tests for controllability & observability.
2. To study the analysis of Non-Linear systems using phase-plane and describing function methods and Lypunov theorem for stability analysis, applications of Euler Lagrange equations.
3. To introduce fundamentals of calculus of variations, minimization techniques and optimal control problems.

**Outcomes:**

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

1. Design a control system using state space model and analyze the systems behavior using stability analysis techniques.
2. Gain knowledge about minimization techniques and optimal control problems which are applicable to design a plant.

**UNIT I**

**STATE SPACE ANALYSIS:** State Space Representation - Solution of State Equation - State Transition Matrix - Canonical Forms – Controllable Canonical Form - Observable Canonical Form - Jordan Canonical Form.

**UNIT II**

**CONTROLLABILITY AND OBSERVABILITY:** Tests for controllability and observability for continuous time systems – Time varying case - Minimum energy control - Time invariant case - Principle of Duality - Controllability and observability form Jordan canonical form and other canonical forms.

**UNIT III**

**DESCRIBING FUNCTION ANALYSIS:** Introduction to nonlinear systems - Types of nonlinearities - Describing functions - Describing function analysis of nonlinear control systems.

**UNIT IV**

**PHASE-PLANE ANALYSIS:** Introduction to phase-plane analysis - Method of Isoclines for Constructing Trajectories - singular points - phase-plane analysis of nonlinear control systems.

**UNIT V**

**STABILITY ANALYSIS:** Stability in the sense of Lyapunov - Lyapunov's stability and Lyapunov's instability theorems - Direct method of Lyapunov for the Linear and Nonlinear continuous time autonomous systems.

**UNIT VI**

**MODEL CONTROL:** Effect of state feedback on controllability and observability - Design of State Feedback Control through Pole placement - Full order observer and reduced order observer.

**UNIT VII**

**CALCULUS OF VARIATIONS:** Minimization of functionals of single function - Constrained minimization - Minimum principle - Control variable inequality constraints - Control and state variable inequality constraints - Euler Lagrangine Equation.

## **UNIT VIII**

**OPTIMAL CONTROL:** Formulation of optimal control problem - Minimum time, Minimum energy, minimum fuel problems - State regulator problem - Output regulator problem - Tracking problem, Continuous - Time Linear Regulators.

### **TEXT BOOKS:**

1. Gopal.M: *Modern Control System Theory*, 2<sup>nd</sup> edition, New Age International (P) Ltd, 1996
2. Nagarath.I.J and Gopal.M: *Control Systems Engineering*, New Age International (P) Ltd.

### **REFERENCE BOOKS:**

1. Ogata.K: *Modern Control Engineering*, 5<sup>th</sup> edition, Prentice Hall of India, 1998
2. Gopal.M: *Digital Control and State Variable Methods*, Tata Mc Graw-Hill Companies, 1997.
3. Stainslaw H. Zak: *Systems and Control*, Oxford Press, 2003.

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**12AEE35 OPTIMIZATION TECHNIQUES  
(Elective-II)**

**Objectives:**

1. To introduce the classical optimization techniques which includes single variable and multivariable optimization with in equality constraints.
2. To know the fundamentals of (LP) linear programming and unconstrained non linear programming techniques & solution of simultaneous equations.
3. To introduce the principles of Dynamic Programming and Transportation problems.

**Outcomes:**

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

1. Gain the knowledge about optimization techniques, Linear programming, Dynamic programming etc for analyzing any physical system.
2. Understand all the computational procedures to analyze the system performance.

**UNIT I**

**INTRODUCTION TO CLASSICAL OPTIMIZATION TECHNIQUES:** Statement of an Optimization problem – Design vector – Design constraints – Constraint surface – Objective function – Objective function surfaces – classification of Optimization problems.

**UNIT II**

**CLASSICAL OPTIMIZATION TECHNIQUES:** Single variable Optimization – Multi variable Optimization without constraints – Necessary and sufficient Conditions for minimum/maximum – Multivariable Optimization with equality constraints - Solution by method of Lagrange Multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

**UNIT III**

**LINEAR PROGRAMMING:** Standard form of a linear programming problem – Geometry of linear programming problems – Definitions and theorems – Solution of a system of linear simultaneous equations – Pivotal reduction of a general system of equations – Motivation to the Simplex method – Simplex algorithm.

**UNIT IV**

**TRANSPORTATION PROBLEM:** Finding initial basic feasible solution by north – West corner rule, least cost method and Vogel's approximation method – Testing for optimality of balanced transportation problems.

**UNIT V**

**UNCONSTRAINED NON LINEAR PROGRAMMING:** One Dimensional minimization methods - Classification, Fibonacci method and Quadratic interpolation method

**UNIT VI**

**UNCONSTRAINED OPTIMIZATION TECHNIQUES:** Univariate method - Powell's method and steepest descent method.

**UNIT VII**

**CONSTRAINED NON LINEAR PROGRAMMING:** Characteristics of a constrained problem - Classification, Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to Convex Programming Problem.

## **UNIT VIII**

**DYNAMIC PROGRAMMING:** Dynamic programming multistage decision processes – Types – Concept of sub optimization and the principle of optimality – Computational procedure in dynamic programming – Examples illustrating the calculus method of solution - Examples illustrating the tabular method of solution.

### **TEXT BOOKS:**

1. Rao.S.S: "*Engineering optimization: Theory and Practice*", 3<sup>rd</sup> edition, New Age International (P) Limited, 1998.
2. Kasene.H.S & Kumar.K.D: "*Introductory Operations Research*", Springer(India), Pvt .Ltd.

### **REFERENCE BOOKS:**

- 1 Mital.K.V and Mohan.C: " *Optimization Methods in Operations Research and systems Analysis*", 3<sup>rd</sup> edition, New Age International (P) Limited, Publishers, 1996.
2. Dr. S.D.Sharma: *Operations Research*, eleventh Edition 1997, Kedarnath Ramnath and company.
3. Taha.H.A: "*Operations Research: An Introduction*", 6<sup>th</sup> edition, PHI Pvt. Ltd.,
4. Hadley. G: *Linear Programming*, Narosa Publishing House, 2002

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**IV B.Tech –I Semester EEE**

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**12AEE36 PROGRAMMABLE LOGIC CONTROL  
(Elective-II)**

**Objectives:**

1. To Understand the basics of, I/O interfacing PLC ladder diagram (Characteristics) of Registers and Module addressing and programmable logic controllers PLC.
2. To introduce PLC functions, Data Handling functions & Distributed control systems.
3. To gain knowledge about logical control unit, operator interfacing and PLC applications in power plant.

**Outcomes:**

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

1. Understand fundamentals of PLC and its various applications in power plant.
2. Acquire knowledge about PLC controllers which are applicable in industries and power sectors.

**UNIT I**

**PLC BASICS:** PLC system - I/O modules and interfacing - CPU processor -programming Equipment - programming formats - Construction of PLC ladder diagrams - Devices connected to I/O modules.

**UNIT II**

**PLC PROGRAMMING:** Input instructions - Outputs, operational procedures, programming examples using contacts and coils- Drill press operation.

**UNIT III**

**DIGITAL LOGIC GATES & LADDER DIAGRAM:** programming in the Boolean algebra system, conversion examples - Ladder Diagrams for process control - Ladder diagrams & sequence listings - Ladder Diagram construction and flowchart for spray process system.

**UNIT IV**

**PLC REGISTERS:** Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.

**UNIT V**

**PLC FUNCTIONS:** Timer functions & Industrial applications, counter function & industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

**UNIT VI**

**DATA HANDLING FUNCTIONS:** SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two-axis & three axis Robots with PLC, Matrix functions.

**UNIT VII**

**DISTRIBUTED CONTROL SYSTEM (DCS):** Evolution – Different Architectures – Logical Control Unit – Operator Interface – Display – Engineering Interface.

**UNIT VIII**

**DCS APPLICATIONS TO POWER PLANT:** Iron and Steel Plants – Chemical Industries – Paper and Pulp Industries.

**TEXT BOOKS:**

1. W. Bolton: *Programmable Logic Controllers*, 5<sup>th</sup> Edition, Elsevier, 2010
2. John W. Webb & Ronald A. Reiss: *Programmable Logic Controllers- Principles and Applications*, Fifth Edition, PHI
3. Michael P. Lucas: *Distributed Control Systems*, 1986 Van no strand, Reinhold Co.

**REFERENCE BOOKS:**

1. JR. Hackworth & F.D Hackworth Jr.: *Programmable Logic Controllers- Programming Method and Applications* – Pearson, 2004.
2. Popovic D and Bhatkar V. P, Marcel Dekkar Inc: *Distributed Computer Control of Industrial Automation*, CRC Press, 1990.

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**12AEE37 POWER ELECTRONICS & SIMULATION LAB**

**PART-A:**

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

1. Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR's- R, RC and UJT firing circuits.
3. Forced Commutation circuits (Class A, Class B, Class C, and Class D)
4. Single Phase Half wave & controlled rectifier with R & RL load.
5. Single Phase fully controlled bridge converter with R and RL loads.
6. Single Phase AC Voltage Controller with R and RL Loads.
7. Single Phase Cycloconverter with R and RL loads.

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Buck converter with R and RL loads.
9. Boost converter with R and RL loads.
10. Simulation of three phase half controlled and full controlled bridge converter with R & RL load.
11. Simulation of single phase inverter with PWM control.
12. Simulation of speed control of separately excited dc motor using MATLAB Simulink.

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**12AEE38 POWER SYSTEMS & SIMULATION LAB**

**PART-A:**

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

1. IDMT characteristics of Over Current relay, Non directional over current relay.
2. Determination of Sequence Impedances of 3-Phase Alternator.
3. Characteristics of static relay UV/OV.
4. Static excitation of synchronous Generator
5. Parallel Operation of Alternators
6. Measurement of Capacitance of 3 core cables (Bridge type)
7. Fault location of Underground Cables (Bridge type)

**PART-B:**

**Any three of the following experiments are required to be conducted:**

8. Simulation of string of insulators for determination of voltage distribution and string efficiency.
9. Fault analysis of 3 phase alternator (LG, LL, LLG, LLLG faults)
10. Determination of sequence impedance of a cylindrical rotor.
11. Simulation of characteristics of over current relay, Directional relay and Non Directional relay using SKM Power tool.
12. Simulation of analysis of Short circuit faults, over current and over voltage faults in over head Transmission Line using SKM Power tool.
13. Simulation of Analysis of Harmonics investigation and Filter Design in Transmission Line using SKM Power tool.
14. Simulation of System Dynamic, Transient Stability and fault analysis in Transmission Line using SKM Power tool.

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**12AEE39 MINI PROJECT**

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**12AEE40 UTILIZATION OF ELECTRICAL ENERGY**

**Objectives:**

1. To study different ways of using electrical energy such as illumination, electric heating, electric welding, electrolytic process.
2. To study electric braking and Traction.

**Outcomes:**

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

1. Acquire knowledge about illumination, electric heating, electric welding and electrolytic process.
2. Understand the concepts of electric traction and various methods of electric braking.

**UNIT I**

**ILLUMINATION:** Definition – Laws of illumination – Polar curves – Calculation of MHCP (Mean Horizontal Candle power) and MSCP (Mean Spherical Candle Power) Lamps: Incandescent lamp, Sodium Vapour lamp, Fluorescent lamp. Requirement of good lighting scheme – Types, Design and Calculation of illumination - Street lighting and Factory lighting – Numerical Problems.

**UNIT II**

**ELECTRIC HEATING:** Advantages - Methods of Electric heating – Resistance, Arc, Induction and Dielectric heating.

**UNIT III**

**ELECTRIC WELDING:** Types – Resistance, Electric arc, gas welding - Ultrasonic, Welding electrodes of various metals, Defects in welding.

**UNIT IV**

**ELECTROLYTIC PROCESS:** Electrolysis - Faradays laws, Application of Electrolysis, Power supply for Electrolysis.

**UNIT V**

**ELECTRIC DRIVES:** Types of DC and AC Motors and their Characteristics – Applications - Electric Braking - Speed Control of DC and AC Motors – Temperature rise and Load Equalization – Selection of Motors for particular Drive.

**UNIT VI**

**ELECTRIC TRACTION – I:** Introduction – Systems of Electric Traction - Comparison between AC and DC Traction – Special features of Traction Motors - Methods of Electric Braking – Plugging, Rheostatic and Regenerative types.

**UNIT VII**

**ELECTRIC TRACTION – II:** Mechanics of train movement - Speed-time curves of different services – trapezoidal and quadrilateral, speed-time curves – Numerical Problems.

## **UNIT VIII**

**ELECTRIC TRACTION-III:** Calculations of tractive effort, Power, specific energy consumption - effect of varying acceleration and braking retardation - Adhesive weight and coefficient of adhesion – Problems.

### **TEXT BOOK:**

1. Openshaw Taylor.E and Rao. V.V.L: *Utilization of Electric Energy*, Universities Press.
2. Rajput.R.K: *Utilization of Electrical Power*, Laxmi Publications.
3. Uppal.S.L. Power systems

### **REFERENCE BOOKS:**

1. Suryanarayana.N.V: *Utilization of Electrical Power including Electric drives and Electric traction*, New Age International (P) Limited, Publishers, 1996.
2. Partab: *Art & Science of Utilization of electrical Energy*, Dhanpat Rai & Co.

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**12AEE41 ENERGY AUDITING AND DEMAND SIDE MANAGEMENT  
(Elective-III)**

**Objectives:**

1. To impart knowledge on energy audit, conservation and management of energy.
2. To study the analysis of energy efficient motors for conservation of energy and reduce losses of the motor.
3. To understand the operation of energy instruments for measurements in energy audits and estimate the depreciation of equipment of power plant.

**Outcomes:**

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

1. Acquire the knowledge of increasing energy efficiency and reduce energy related cost.
2. Develop energy efficient motors and satisfying the load demand using different techniques like load priority technique, load forecasting etc.

**UNIT I**

**INTRODUCTION:** Energy situation – world and India, energy consumption, conservation, Codes, standards and Legislation.

**UNIT II**

**ENERGY AUDITING:** Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes. Measurements in energy audits, presentation of energy audit results.

**UNIT III**

**ENERGY EFFICIENT MOTORS:** Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

**UNIT IV**

**POWER FACTOR IMPROVEMENT:** Power factor – methods of improvement, location of capacitors, p.f with non linear loads, effect of harmonics on p.f , p.f motor controllers.

**UNIT V**

**LIGHTING AND ENERGY INSTRUMENTS:** Good lighting system design and practice, lighting control ,lighting energy audit - Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tong testers ,application of Programable Logic Control (PLC)

**UNIT VI**

**ENERGY ECONOMIC ANALYSIS:** The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems.

**UNIT VII**

**DEMAND SIDE MANAGEMENT – I:** Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning.

## **UNIT-VIII**

**DEMAND SIDE MANAGEMENT – II:** Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization of Energy Conservation awareness Programs.

### **TEXT BOOK:**

1. Arry C. White, Philip S. Schmidt, David R. Brown: *Industrial Energy Management Systems*, Hemisphere Publishing Corporation, New York.
2. Albert Thumann, Englewood Cliffs: *Fundamentals of Energy Engineering*. Prentice Hall Inc, New Jersey.
3. Pabla.A.S: *Electrical Power distribution*, 5<sup>th</sup> edition, TMH, 2004
4. Jyothi Prakash: *Demand Side Management*, TMH Publishers.

### **REFERENCE BOOKS:**

1. Murphy.W.R & Mckay.G: *Butter worth Energy management*, Heinemann publications.
2. Paul o' Callaghan: *Energy management*, 1<sup>st</sup> edition, Mc-graw Hill Book company, 1998
3. John .C. Andreas: *Energy efficient electric motors*, 2<sup>nd</sup> edition, Marcel Dekker Inc Ltd, 1995.
4. Turner.W.C, John wiley and sons: *Energy management hand book*.
5. Sen.D.P, Padiyar.K.R, Indrane Sen, Pai.M.A: *Recent Advances in Control and Management of Energy Systems*, Interline Publisher, Bangalore, 1993.
6. Ashok V. Desai: *Energy Demand – Analysis, Management and Conservation*, Wiley Eastern, 2005.

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**12AEE42 ELECTRICAL MACHINE DESIGN  
(Elective-III)**

**Objectives:**

1. To study MMF calculations and thermal rating of various types of electrical machines.
2. To design core, windings, and cooling systems of transformer.
3. To design stator and rotor of induction and synchronous machines of their behavior.

**Outcomes:**

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

1. Design all electrical machines with reduction in size and optimized thermal behavior.
2. Design transmission and distribution transformers and to know the cooling systems of the transformers.

**UNIT I**

**INTRODUCTION:** Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor –Choice of Specific Electrical and Magnetic loadings - Thermal considerations

**UNIT II**

**DC MACHINES:** Output Equations – Main Dimensions - Magnetic circuit calculations – Carter’s Coefficient – Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature –Design of commutator and brushes – performance prediction using design values.

**UNIT III**

**TRANSFORMERS:** Output Equations – Main Dimensions - KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise in Transformers – Design of Tank

**UNIT IV**

**INDUCTION MOTORS-I:** Output equation of Induction motor – Main dimensions – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor.

**UNIT V**

**INDUCTION MOTORS-II:** Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current - Short circuit current – Circle diagram - Operating characteristics.

**UNIT VI**

**SYNCHRONOUS MACHINES-I:** Output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length.

**UNIT VII**

**SYNCHRONOUS MACHINES-II:** Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

## **UNIT VIII**

**GENERAL CONSIDERATIONS:** Heat flow Temperature rise – Rating of Machines – Standard Specifications – Cooling of Transformers.

### **TEXT BOOKS:**

1. Sawhney.A.K: 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen.S.K: 'Principles of Electrical Machine Designs with Computer Programmes', Oxford And IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

### **REFERENCE BOOKS:**

1. Shanmugasundaram.A, Gangadharan.G, Palani.R: 'Electrical Machine Design Data Book', New Age International Pvt. Ltd., Reprint 2007.
2. Claytar, Performance and design of DC Machine.
3. Fizarald and Kingslar, Performance and design of AC Machine.

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**IV B.Tech –II Semester EEE**

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**12AEE43 FACTS AND CUSTOM POWER DEVICES  
(Elective-III)**

**Objectives:**

1. To impart knowledge on FACTS concepts and application of Custom power devices.
2. To introduce different types of controllers for FACTS devices and multilevel invertors.
3. To implement Custom power devices to instigate harmonics, voltage sag, voltage swell etc.

**Outcomes:**

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

1. Design the facts controllers for regulating the power flow in the transmission line and improve the stability.
2. Develop control techniques for convertors, inverters for compensation of real and reactive power in transmission line.

**UNIT I**

**FACTS CONCEPT AND GENERAL SYSTEM CONSIDERATION:** Transmission Interconnection – Flow of Power in an AC System – Power flow and dynamic stability considerations – Relative importance of controllable parameters – Basic types of FACTS controllers – Brief description and definitions of FACTS Controllers – Check list of Possible benefits from FACTS Technology.

**UNIT II**

**CONVERTERS FOR STATIC COMPENSATION:** Three phase converters and standard modulation strategies (Programmed Harmonic Elimination and SPWM) - GTO Inverters - Multi-Pulse Converters and Interface Magnetics - Transformer Connections for 12, 24 and 48 pulse operation.

**UNIT III**

**MULTI-LEVEL INVERTERS:** Diode Clamped Type and Flying Capacitor Type and suitable modulation strategies (includes SVM) - Multi-level inverters of Cascade Type and their modulation - Current Control of Inverters.

**UNIT IV**

**STATIC SHUNT AND SERIES COMPENSATORS:** Static Shunt Compensators - SVC and STATCOM - operation and control of TSC, TCR, STATCOM - Compensator Control - Comparison between SVC and STATCOM - STATCOM for transient and dynamic stability enhancement.

**UNIT V**

**STATIC SERIES COMPENSATION:** GCSC, TSSC, TCSC and SSSC - operation and control - external system control for series compensators - SSR and its damping - static voltage and phase angle regulators - TCVR and TCPAR - operation and control.

**UNIT VI**

**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.

## **UNIT VII**

**INTRODUCTION TO CUSTOM POWER DEVICES:** Custom power devices – Distribution STATCOM – Dynamic Voltage restorer – Unified Power Quality Conditioner

## **UNIT VIII**

**POWER QUALITY:** Power Quality issues related to distribution systems Application of D-STATCOM, DVR and UPQC for improving power quality in distribution systems.

### **TEXT BOOKS:**

1. N.G. Hingorani & L. Gyugyi: *Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems*.
2. K. R. Padiyar: *FACTS Controllers in Power Transmission and Distribution*, New Age International Publishers.

### **REFERENCE BOOKS:**

1. T.J.E Miller: *Reactive Power Control in Electric Systems*, John Wiley & Sons.
2. Ned Mohan: *Power Electronics*, John Wiley and Sons.
3. Dr Ashok S & Suresh K S Kumar: "*FACTS Controllers and applications*", course book for STTP, 2003.

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**12AEE44 SPECIAL ELECTRICAL MACHINES  
(Elective-IV)**

**Objectives:**

1. To impart knowledge on special type of electrical machines and their performance characteristics
2. To brief introduction of stepper motor, switch reluctance motor, permanent magnet motor, brushless DC motor and linear induction motor.

**Outcomes:**

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

1. Know the construction, principle of operation & performance characteristics of special electrical machines as an extension to the study of basic electrical machines.
2. Design, the special electrical machines for industrial and domestic application.

**UNIT I**

**SPECIAL TYPES OF D. C. MACHINES – I:** Series booster – Shunt booster – Non – reversible booster – Reversible booster

**UNIT II**

**SPECIAL TYPES OF D.C. MACHINES – II:** Armature excited machines – Rosenberg generator – The Amplidyne and Metadyne - Rototrol and Regulex– Third brush generator – Three wire generator - Dynamometer.

**UNIT III**

**STEPPER MOTORS:** Introduction – Synchronous Inductor (or Hybrid Stepper Motor), Hybrid Stepping Motor, Construction, Principle of Operation, Energisation with two phase at a time – Essential conditions for the satisfactory Operation of a 2 – Phase Hybrid Step Motor –Very Slow-Speed Synchronous Motor for Servo Control – Different Configurations for Switching the Phase Windings – Control Circuits for Stepping Motors – An Open – Loop Controller for a 2-Phase Stepping Motor.

**UNIT IV**

**VARIABLE RELUCTANCE STEPPING MOTORS:** Variable Reluctance (VR) Stepping Motors, Single – Stack VR step motors, Multiple stack VR motors – Open – Loop Control of 3-Phase VR Step Motor – Closed – Loop Control of Step Motor, Discriminator (or rotor position sensor), Translator, Major loop – Characteristics of Step Motor in Open – Loop Drive – Comparison between Open-Loop Position Control with Step Motor and a Position Control Servo using a Conventional (dc or ac) Servo Motor – Suitability and Areas of Application of Stepping Motors – Five Phase Hybrid Stepping Motor – Single Phase Stepping Motor, The Construction, Operating Principle, Torque developed in the Motor.

**UNIT V**

**SWITCHED RELUCTANCE MOTOR:** Introduction – Improvements in the Design of Conventional reluctance Motors – Distinctive Differences between SR and Conventional Reluctance Motors – principle of Operation of SRM – Design Aspects of Stator and Rotor Pole Arcs, Design of stator and Rotor and pole Arcs in SR Motor, Determination of  $L(\theta) - \theta$  Profile – Power Converter for SR Motor – A Numerical Example - Rotor Sensing Mechanism and Logic Control, Drive and Power Circuits, Position Sensing of rotor with Numerical Problems – Derivation of Torque Expression, General and Linear Case.

## **UNIT VI**

**PERMANENT MAGNET MATERIALS AND MOTORS:** Introduction, Hysteresis loops and recoil line – Stator Frames (Pole – and Yoke – Part) of Conventional PM DC Motors, Equivalent circuit of a PM – Development of Electronically Commutated DC Motor from Conventional DC Motor.

## **UNIT VII**

**BRUSHLESS DC MOTOR:** Types of Construction – Principle of Operation of BLDM – Sensing and Switching Logic Scheme, Sensing, Logic Controller, Lockout Pulses – Drive and Power Circuits, Base Drive Circuit, Power Converter Circuit – Theoretical Analysis and Performance Prediction, Modeling and magnet circuit, d-q analysis of BLDM – Transient Analysis – Formulation in terms of Flux Linkages as State Variables – Approximate Solutions for Current and Torque under Steady State – Theory of BLDM as Variable Speed Synchronous Motor (Assuming Sinusoidal Flux Distribution) – Methods of reducing Torque Pulsations, 180° Pole Arc and 120° current sheet.

## **UNIT VIII**

**LINEAR INDUCTION MOTOR:** Development of a Double sided LIM from Rotary type IM – A Schematic of LIM Drive for Electric Traction – Development of one sided LIM with back Iron – Field Analysis of a DSLIM: Fundamental Assumptions.

### **TEXT BOOKS:**

1. Venkataratnam.K: *Special Electrical Machines*, University Press.
2. Rajput.R.K: *Electrical machines*, 4<sup>th</sup> Edition, Laxmi Publications. [For Chapters I and II refer Chapter VIII of this book]
3. Say.M.G & Taylor.E.O: *D. C. Machines*, 2<sup>nd</sup> Edition, ELBS.

### **REFERENCE BOOKS:**

1. Athani.V.V: *Stepper Motors: Fundamentals, Applications and Design*, New Age International Pub.
2. Mohan. N, Undeland & Robbins: *Power Electronics - Converters, Applications & Design*, Wiley India, Student Edition.
3. Johan E. Gibson and F. B. Teuter: *Control System Components*, Mc Graw Hill Edition.

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**12AEE45 RENEWABLE ENERGY SOURCES  
(Elective-IV)**

**Objectives:**

1. To familiarize with the solar energy and its radiation, collectors, storage and its applications
2. To introduce horizontal & vertical axis wind mills and their performance characteristics.
3. To understand the operation of types of biogas digesters, geothermal energy and ocean energy as alternative energy sources.

**Outcomes:**

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

1. Acquire knowledge of generation of electric power with solar and wind energy system
2. Understand the technologies to extract electrical energy from biomass, geothermal energy and tidal energy

**UNIT I**

**PRINCIPLES OF SOLAR RADIATION:** Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT II**

**SOLAR ENERGY COLLECTION:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**UNIT III**

**SOLAR ENERGY STORAGE AND APPLICATIONS:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Energy Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT IV**

**WIND ENERGY:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz coefficient.

**UNIT V**

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

**UNIT VI**

**GEOTHERMAL ENERGY:** Resources, types of wells, methods of harnessing Geothermal energy, potential in India.

**UNIT VII**

**OCEAN ENERGY:** OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants and their economics.

**UNIT VIII**

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule – Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD Engine, Power generation systems,

electron-gas dynamic conversion, economic aspects. Fuel cells, principles, Faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Rai.G.D: *Non-Conventional Energy Sources*, Khanna Publishers
2. Twidell & Wier: *Renewable Energy Resources*, CRC Press( Taylor & Francis)

**REFERENCE BOOKS:**

1. Tiwari and Ghosal: *Renewable energy resources*, Narosa.
2. Ramesh & Kumar: *Renewable Energy Technologies*, Narosa.
3. Mittal.K, Wheeler: *Non-Conventional Energy Systems*
4. Kothari.D.P, Singhal.K.C: *Renewable energy sources and emerging technologies*, PHI.
4. FARAT: *Integration of RES*

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**12AEE46 POWER SYSTEMS DEREGULATION  
(Elective-IV)**

**Objectives:**

1. To introduce electric utilities, management inner zonal/ intra zonal congestion, oasis –open access system and transfer capability issues.
2. To understand electricity pricing, electricity price volatility short-time price forecasting, power system operation in competitive environment.
3. To understand ancillary services management, reactive power as ancillary service.

**Outcomes:**

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

1. Impart knowledge on topographical issues in electricity markets.
2. Analyze various types of electricity market operational and control issues using mathematical models.

**UNIT I**

**NEED AND CONDITIONS FOR DEREGULATION:** Introduction of Market structure - Market Architecture - Spot market - Forward markets and settlements.

**UNIT II**

**REVIEW OF CONCEPTS:** Marginal cost of generation - Least-cost operation - Incremental cost of generation - Power System Operation: Old vs. New

**UNIT III**

**ELECTRICITY SECTOR:** Structures and Ownership /management - The forms of Ownership and management - Different structure model like Monopoly model - Purchasing agency model - wholesale competition model - Retail competition model.

**UNIT IV**

**FRAMEWORK AND METHODS:** Analysis of Bilateral and pool markets - LMP based Markets - Auction models and price formation - Price Based Unit Commitment - country practices

**UNIT V**

**TRANSMISSION NETWORK AND MARKET POWER:** Power wheeling transactions and marginal costing - Transmission costing.

**UNIT VI**

**CONGESTION MANAGEMENT METHODS:** Market splitting - Counter-trading - Effect of congestion on LMPs - country practices

**UNIT VII**

**ANCILLARY SERVICES AND SYSTEM:** Security in Deregulation - Classifications and definitions - AS management in various markets - Country practices.

**UNIT VIII**

**ECONOMIC CONSTRAINTS:** Technical, economic & regulatory issues involved in the deregulation of the power industry.

**TEXT BOOKS:**

1. S. Stoft: *Power System Economics Designing markets for electricity.*
2. J. Wood and B. F. Wollenberg: *Power generation, operation and control.*
3. K. Bhattacharya, M.H.J. Bollen and J.E.Daalder: *Operation of restructured power systems.*

**REFERENCE BOOKS:**

1. M. Shahidehpour, H. Yamin: *Market operations in electric power systems.*
2. S. Kirschen and G. Strbac: *Fundamentals of power system economics.*
3. N. S. Rau: *Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry.*
4. Sally Hunt and Graham Shuttleworth: *Competition and Choice in Electricity.*

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**12AEE47 HIGH VOLTAGE ENGINEERING  
(Elective-V)**

**Objectives:**

1. To deal with the generation of high voltages in the laboratory, the breakdown phenomena in gases, liquid and solid dielectrics.
2. To generate and measure high AC, DC, impulse and switching surges.
3. To study the non-destructive testing of insulating systems and the high voltage testing of various power system equipment.

**Outcomes:**

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

1. Adequate insight into the theories of breakdown in all types of insulating systems.
2. Know the methods of generating and measurement of various types of high voltages
3. Gain the knowledge of conducting various high voltage tests will also be acquired.

**UNIT I**

**INTRODUCTION:** Introduction to HV technology, need for generating high voltages in laboratory, Industrial applications of high voltage, Electrostatic precipitation, separation.

**UNIT II**

**BREAKDOWN IN GASEOUS AND LIQUID DIELECTRICS:** Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law, Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

**UNIT III**

**BREAKDOWN IN SOLID DIELECTRICS:** Intrinsic breakdown, electromechanical breakdown, thermal breakdown, Partial discharge, breakdown of solid dielectrics, Breakdown in composite dielectrics.

**UNIT IV**

**GENERATION OF HV AC AND DC VOLTAGES:** HV AC transformer: Need for cascade connection and working of transformers units connected in cascade, Series resonant circuit- principle of operation and advantages - Tesla coil - HV DC- voltage doubler circuit, Cockroft - Walton type high voltage DC set - Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop.

**UNIT V**

**GENERATION OF IMPULSE VOLTAGE AND CURRENT:** Introduction to standard lightning and switching impulse voltages - Analysis of single stage impulse generator-expression for Output impulse voltage - Multistage impulse generator, working of Marx impulse generator, Rating of impulse generator - Components of multistage impulse generator - Triggering of impulse generator by three electrode gap arrangement - Trigatron gap and oscillograph time sweep circuits, Generation of switching impulse voltage - Generation of high impulse current.

**UNIT VI**

**MEASUREMENT OF HIGH VOLTAGES:** Electrostatic voltmeter-principle, construction and limitation - Chubb and Fortescue method for HV AC measurement - Generating voltmeter- Principle, construction - Series resistance micro ammeter for HV DC measurements - Standard sphere gap measurements of HVAC, HVDC and impulse voltages - Factors affecting the measurements - Potential dividers-resistance dividers,

capacitance dividers and mixed RC potential dividers - Measurement of high impulse currents - Rogowsky coil.

#### **UNIT VII**

**NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES:** Dielectric loss and loss angle measurements using Schering Bridge – Partial discharge measurements – Factors affecting the discharge detection – Methods of Discharge detection – Straight and balanced methods.

#### **UNIT VIII**

**HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS:** Definitions and terminology, tests on isolators, circuit breakers, cables, insulators and transformers.

#### **TEXT BOOKS:**

1. Naidu.M.S and Kamaraju.V: *High Voltage Engineering*, 4<sup>th</sup> Edition, TMH Publications
2. C.L.Wadhwa: *High Voltage Engineering*, New Age Internationals (P) Limited, 1997.
3. Begamudre.R.D: *High Voltage Engineering Problems & Solutions*, First Edition, New Age International Publishers, 2010.

#### **REFERENCE BOOKS:**

1. Kuffel.E, Zaengl.W.S, Kuffel.J: *High Voltage Engineering: Fundamentals*, 2<sup>nd</sup> Edition, Elsevier Publications.
2. Ravindra Arora, Wolfgang Mosch: *High Voltage Insulation Engineering*, New Age International (P) Limited, 1995.
3. Alston.L.L: *High Voltage Technology*, Second Edition, OXFORD University Press, 2009.

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**12AEE48 INTER-CONNECTED POWER SYSTEMS  
(Elective-V)**

**Objectives:**

1. To introduce the power system stability problems Basic concepts of modeling and analysis of dynamic systems.
2. To understand Modeling of power system components, generators, transmission lines, excitation of prime mover controllers, stability of single machines and multi-machine systems is analyzed using detail simulation and small-signal analysis techniques.
3. To impact the system planning & problems on power systems planning of operation.

**Outcomes:**

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

1. Gather knowledge about the interconnected power systems and its necessities.
2. Implement simulation models in stability control of machine systems.

**UNIT I**

**INTRODUCTION:** Concept of Interconnection, Hierarchical Grid arrangements, Cascade Tripping, Islanding, Load dispatch centre

**UNIT II**

**GENERAL SYSTEM MODELING:** Per unit system, Power transfer through Line, Universal circle diagram, MVAR control, Voltage control methods.

**UNIT III**

**LOAD FLOW STUDIES - I:** Introduction, Network model formulation, Formation of bus admittance matrix, Load flow problem, Load flow solution, Different methods and their comparison.

**UNIT IV**

**LOAD FLOW STUDIES - II:** Introduction, Static Load Flow Equations, Bus Classifications, Approximate method, Gauss-Seidel Method, Newton Raphson Method, Fast Decoupled Load Flow Method, Comparison of different methods, Numerical Problems.

**UNIT V**

**ECONOMIC OPERATION OF POWER SYSTEMS:** Economic operation of generators within the plant, Transmission losses as a function of plant generation, Economic distribution of load between plants, Co-ordinating transmission losses, Krone's method for evaluating loss co-efficient, Penalty factor, Algorithm of different scheme, Automatic Load dispatching.

**UNIT VI**

**LOAD FREQUENCY CONTROL:** Introduction, Single area control of frequency, Modeling of turbine governor, turbine and generator, Steady state analysis, Principle of frequency control, Flat and selective frequency, Tie line control methods.

**UNIT VII**

**POWER SYSTEM STABILITY:** Stability problem, Classification, Power angle characteristics, Steady state and transient stability and their limits.

## **UNIT VIII**

**DYNAMICS OF SYNCHRONOUS MACHINE AND SWING EQUATION:** Effect of saliency and Saturation, Control of power flow, Synchronizing power co-efficient, Equal area criterion and its application to determine stability in different cases, Critical clearing time and angle, Swing-equation and its numerical solution.

### **TEXT BOOKS:**

1. Nagrath and Kothari: *Modern Power system analysis*, Tata- McGraw Hill
2. Stevenson: *Power system analysis*.
3. C.L.Wadhwa: *Electric Power system*.

### **REFERENCE BOOKS:**

1. John J. Grainger & Jr. Stevenson: *Power System Analysis*, Mcgraw-Hill
2. Hadi Saadat: *Power System Analysis*, Tata-McGraw-Hill.
3. T. K. Nagsarkar & M. S. Sukhija: *Power System Analysis*, Oxford University Press

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**12AEE49 POWER SYSTEMS DYNAMICS AND STABILITY  
(Elective-V)**

**Objectives:**

1. To study the synchronous machine modeling, steady state analysis, modeling of excitation systems, modeling of turbine and speed governing system.
2. To introduce small signal stability analysis without controllers
3. To understand power system stabilizer, effect of excitation system and single machine infinite bus configuration

**Outcomes:**

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

1. Capture the modeling of turbine, excitation system and speed governing system
2. Implement the real coded power systems and machine with dynamic stability.

**UNIT I**

**SYNCHRONOUS MACHINE MODELLING:** Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, MMF waveforms, direct and quadrature axes, Mathematical description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq Transformation: flux linkage and voltage equations for stator and rotor in dq coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: Lad-reciprocal per unit system.

**UNIT II**

**STEADY-STATE ANALYSIS:** Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies.

**UNIT III**

**MODELING OF EXCITATION SYSTEMS:** Excitation System Requirements - Elements of an Excitation System - Types of Excitation Systems - Control and protective functions.

**UNIT IV**

**MODELING OF TURBINE AND SPEED GOVERNING SYSTEMS:** Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristics of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only.

**UNIT V**

**SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS-I:** Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State- space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor.

## **UNIT VI**

**SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS-II:** Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

## **UNIT VII**

**SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS-I:** Effects of Excitation Systems: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example.

## **UNIT VIII**

**SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS-II:** Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with a numerical example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines.

## **TEXT BOOKS:**

1. Kundur.P: *Power System Stability and Control*, McGraw-Hill, 1993.
2. Anderson.P.M and Fouad.A.A: *Power System Control and Stability*, Iowa State University Press, Ames, Iowa, 1978.

## **REFERENCE BOOKS:**

1. IEEE Committee Report, *Dynamic Models for Steam and Hydro Turbines in Power System Studies*, IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. On Turbine- Governor Model.

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**12AEE50 COMPREHENSIVE VIVA VOCE**

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**12AEE51 PROJECT**