1. Conditions for Admission:

(a) Candidates for admission to the first semester of the 8 semester B.Tech Degree programme should be required to have passed:

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the Government of Tamil Nadu or any other examination equivalent there to with minimum of 45% marks (a mere pass for OBC and SC/ST candidates) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / Biology (Botany & Zoology) or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

(b) For Lateral entry into third semester of the eight semester B.Tech programme:

The minimum qualification for admission is a pass in three year diploma or four year sandwich diploma course in engineering / technology with a minimum of 60% marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in the subjects covered from 3rd to final semester or a pass in any B.Sc. course with mathematics as one of the subjects of study with a minimum of 60% marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in main and ancillary subjects excluding language subjects. The list of diploma programs approved for admission for each of the degree programs is given in Annexure A.

2. Age Limit:

The candidate should not have completed 21 years of age as on 1st July of the academic year under consideration. For Lateral Entry admission to second year of degree programme, candidates should not have completed 24 years as on 1st July of the academic year under consideration. In the case of SC/ST candidates, the age limit is relaxable by 3 years for both the cases.

3. Duration of Programme:

The Bachelor of Technology degree programme shall extend over a period of 8 consecutive semesters spread over 4 academic years – two semesters constituting one academic year. The duration of each semester shall normally be 15 weeks excluding examinations.
4. **Eligibility for the award of Degree:**

No candidate shall be eligible for the award of the degree of Bachelor of Technology, unless he/she has undergone the course for a period of 8 semesters (4 academic years) / 6 semesters (3 academic years for Lateral Entry candidates) in the faculty of Engineering and has passed the prescribed examinations in all the semesters.

5. **Branches of Study:**

- Branch I - Civil Engineering
- Branch II - Mechanical Engineering
- Branch III - Electronics & Communication Engineering
- Branch IV - Computer Science & Engineering
- Branch V - Electrical & Electronics Engineering
- Branch VI - Chemical Engineering
- Branch VII - Electronics & Instrumentation Engineering
- Branch VIII - Information Technology
- Branch IX - Instrumentation & Control Engineering
- Branch X - Biomedical Engineering

or any other branches of study as and when offered. The branch allocation shall be ordinarily done at the time of admission of the candidate to the first semester.

6. **Subjects of Study:**

The subjects of study shall include theory and practical courses as given in the curriculum and shall be in accordance with the prescribed syllabus. The subjects of study for the first two semesters shall be common for all branches of study.

7. **Examinations:**

The theory and practical examinations shall comprise continuous assessment throughout the semester in all subjects as well as university examinations conducted by Pondicherry University at the end of the semester (November / December or April / May).

(a) Theory courses for which there is a written paper of 75 marks in the university examination.

The Internal Assessment marks of 25 has to be distributed as 10 marks each for two class tests and 5 marks for class attendance in the particular subject. The distribution of marks for attendance is as follows.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Marks</th>
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<tbody>
<tr>
<td>95% and above</td>
<td>5</td>
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<tr>
<td>90% and above</td>
<td>4</td>
</tr>
<tr>
<td>85% and above</td>
<td>3</td>
</tr>
<tr>
<td>80% and above</td>
<td>2</td>
</tr>
<tr>
<td>75% and above</td>
<td>1</td>
</tr>
</tbody>
</table>
In total, three tests are to be conducted and the better two are to be considered for assessment.

(b) Practical courses for which there is a university practical examination of 50 marks:

The internal assessment marks of 50 has to be distributed as 20 marks for the periodic practical works and records submitted thereof, 15 marks for an internal practical examination, 5 marks for an internal viva voce, and 10 marks for class attendance in the particular subject. The distribution of marks is as given below.

- 10 marks for 95% and above
- 8 marks for 90% and above but below 95%
- 6 marks for 85% and above but below 90%
- 4 marks for 80% and above but below 85%
- 2 marks for 75% and above but below 80%

8. Requirement for appearing for University Examination:

A candidate shall be permitted to appear for university examinations at the end of any semester only if:

(i) He / She secures not less than 75% overall attendance arrived at by taking into account the total number of periods in all subjects put together offered by the institution for the semester under consideration.

(Candidates who secure overall attendance greater than 60% and less than 75% have to pay a condonation fee as prescribed by University along with a medical certificate obtained from a medical officer not below the rank of Asst. Director)

(ii) He / She earns a progress certificate from the Head of the institution for having satisfactorily completed the course of study in all the subjects pertaining to that semester.

(iii) His / Her conduct is found to be satisfactory as certified by the Head of the institution.

A candidate who has satisfied the requirement (i) to (iii) shall be deemed to have satisfied the course requirements for the semester.

9. Procedure for completing the course:

A candidate can join the course of study of any semester only at the time of its normal commencement and only if he/she has satisfied the course requirements for the previous semester and further has registered for the university examinations of the previous semester in all the subjects as well as all arrear subjects if any.

However, the entire course should be completed within 14 consecutive semesters (12
consecutive semesters for students admitted under lateral entry).

10. **Passing Minimum:**

(i) A candidate shall be declared to have passed the examination in a subject of study only if he/she secures not less than 50% of the total marks (Internal Assessment plus University examination marks) and not less than 40% of the marks in University examination.

(ii) A candidate who has been declared “Failed” in a particular subject may reappear for that subject during the subsequent semesters and secure a pass. However, there is a provision for revaluation of failed or passed subjects provided he/she fulfills the following norms for revaluation.

(a) Applications for revaluation should be filed within 4 weeks from the date of declaration of results or 15 days from the date of receipt of marks card whichever is earlier.

(b) The candidate should have attended all the college examinations as well as university examinations.

(c) If a candidate has failed in more than two papers in the current university examination, his/her representation for revaluation will not be considered.

(d) The request for revaluation must be made in the format prescribed duly recommended by the Head of the Institution along with the revaluation fee prescribed by the University.

The internal assessment marks obtained by the candidate shall be considered only in the first attempt for theory subjects alone. For the subsequent attempts, University examination marks will be made up to the total marks. Further the University examination marks obtained in the latest attempt shall alone remain valid in total suppression of the University examination marks obtained by the candidate in earlier attempts.

11 **Award of Letter Grades:**

The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below:

<table>
<thead>
<tr>
<th>Range of Total Marks</th>
<th>Letter</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 to 100</td>
<td>S</td>
<td>10</td>
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<tr>
<td>80 to 89</td>
<td>A</td>
<td>9</td>
</tr>
<tr>
<td>70 to 79</td>
<td>B</td>
<td>8</td>
</tr>
<tr>
<td>60 to 69</td>
<td>C</td>
<td>7</td>
</tr>
<tr>
<td>55 to 59</td>
<td>D</td>
<td>6</td>
</tr>
</tbody>
</table>
50 to 54 E 5
0 to 49 F 0
Incomplete FA

‘F’ denotes failure in the course. ‘FA’ denotes absent / detained as per clause 8.

After results are declared, grade sheets will be issued to the students. The grade sheets will contain the following details:

(a) The college in which the candidate has studied.

(b) The list of courses enrolled during the semester and the grades scored.

(c) The Grade Point Average (GPA) for the semester and The Cumulative Grade Point Average (CGPA) of all enrolled subjects from first semester onwards.

(d) GPA is the ratio of sum of the products of the number of credits (C) of courses registered and the corresponding grades points (GP) scored in those courses, taken for all the courses and sum of the number of credits of all the courses

\[ \text{GPA} = \frac{\text{Sum of } (C \times GP)}{\text{Sum of } C} \]

CGPA will be calculated in a similar manner, considering all the courses enrolled from first semester. FA grades are to be excluded for calculating GPA and CGPA.

The conversion of CGPA into percentage marks is as given below

\[ \% \text{Marks} = (CGPA - 0.5) \times 10 \]

12 Award of Class and Rank:

(i) A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of 7 years (6 years for lateral entry candidates) reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

(ii) A candidate who qualifies for the award of the degree passing in all subjects pertaining to semesters 3 to 8 in his/her first appearance within 6 consecutive semesters (3 academic years) and in addition secures a CGPA of 8.50 and above for the semesters 3 to 8 shall be declared to have passed the examination in \textbf{FIRST CLASS with DISTINCTION}.

(iii) A candidate who qualifies for the award of the degree by passing in all subjects relating to semesters 3 to 8 within a maximum period of eight semesters after his/her commencement of study in the third semester and in addition secures CGPA not less than 6.5 shall declared to have passed the examination in \textbf{FIRST CLASS}.
(iv) All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

(v) For the Award of University ranks and Gold Medal for each branch of study, the CGPA secured from 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th semester in the first attempt. Rank certificates would be issued to the first ten candidates in each branch of study.

13. **Provision for withdrawal:**

A candidate may, for valid reasons, and on the recommendation of the Head of the Institution be granted permission by the University to withdraw from writing the entire semester examination as one Unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire course. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank.

14. **Discontinuation of Course:**

If a candidate wishes to temporarily discontinue the course for valid reasons, he/she shall apply through the Head of the Institution in advance and obtain a written order from the University permitting discontinuance. A candidate after temporary discontinuance may rejoin the course only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees to the University. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 7 years, including of the period of discontinuance.

15. **Revision of Regulations and Curriculum:**

The University may from time to time revise, amend or change the regulations of curriculum and syllabus as and when found necessary.
### ANNEXURE – A

<table>
<thead>
<tr>
<th>B.Tech courses in which admission is sought</th>
<th>Diploma courses eligible for admission</th>
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</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>Civil Engineering</td>
</tr>
<tr>
<td></td>
<td>Civil and Rural</td>
</tr>
<tr>
<td></td>
<td>Engineering Architectural</td>
</tr>
<tr>
<td></td>
<td>Assistantship Architecture</td>
</tr>
<tr>
<td></td>
<td>Agricultural Engineering</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td></td>
<td>Automobile Engineering</td>
</tr>
<tr>
<td></td>
<td>Agricultural Engineering</td>
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<tr>
<td></td>
<td>Mechanical and Rural</td>
</tr>
<tr>
<td></td>
<td>Engineering Refrigeration and</td>
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<tr>
<td></td>
<td>Air-conditioning Agricultural</td>
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<tr>
<td></td>
<td>Engineering &amp; Farm Equipment</td>
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<tr>
<td></td>
<td>Technology</td>
</tr>
<tr>
<td></td>
<td>Metallurgy</td>
</tr>
<tr>
<td></td>
<td>Production Engineering</td>
</tr>
<tr>
<td></td>
<td>Machine Design &amp; Drafting</td>
</tr>
<tr>
<td></td>
<td>Machine tool maintenance and Repairs</td>
</tr>
<tr>
<td></td>
<td>Printing Technology /</td>
</tr>
<tr>
<td></td>
<td>Engineering Textile Engineering /</td>
</tr>
<tr>
<td></td>
<td>Technology Tool Engineering</td>
</tr>
<tr>
<td>Electrical and Electronics Engineering</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Electronics &amp; Communication Engineering</td>
<td>Electrical and Electronics Engineering</td>
</tr>
<tr>
<td>Electronic and Instrumentation Engineering</td>
<td>Electronics and Instrumentation</td>
</tr>
<tr>
<td>Instrumentation and Control Engineering</td>
<td>Engineering</td>
</tr>
<tr>
<td>Bio Medical Engineering</td>
<td>Instrumentation Engineering /</td>
</tr>
<tr>
<td></td>
<td>Technology</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>Chemical Engineering</td>
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<td>Technology Petroleum</td>
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<td>Engineering Ceramic</td>
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<td></td>
<td>Technology</td>
</tr>
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<td></td>
<td>Plastic Engineering</td>
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<td>Paper &amp; Pulp Technology</td>
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<td>Polymer Technology</td>
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<td></td>
<td>Engineering Electronics &amp; Instrumentation Engineering</td>
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<td></td>
<td>Instrumentation Engineering /</td>
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<td></td>
<td>Technology</td>
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## I SEMESTER

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<th>Code No.</th>
<th>Name of the Subjects</th>
<th>Periods</th>
<th>Credits</th>
<th>Marks</th>
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<td>T103</td>
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<td>T110</td>
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<td>T111</td>
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<tr>
<td>T112</td>
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<tr>
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<td>P105</td>
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<td>P106</td>
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*To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.

## II SEMESTER

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<tr>
<th>Code No.</th>
<th>Name of the Subjects</th>
<th>Periods</th>
<th>Credits</th>
<th>Marks</th>
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<td></td>
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<td>T107</td>
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*To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation.*
### III SEMESTER

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<th>Name of the Subjects</th>
<th>Periods</th>
<th>Credits</th>
<th>Marks</th>
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<td>T</td>
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### IV SEMESTER

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<th>Name of the Subjects</th>
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<th>Credits</th>
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<td>EE T46</td>
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<td>Object Oriented Programming Lab</td>
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*To be completed in III and IV semesters, under Pass / Fail option only and not counted for CGPA calculation.

http://eee.pec.edu
### V SEMESTER

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<th>Name of the Subjects</th>
<th>Periods</th>
<th>Credits</th>
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### VI SEMESTER

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LIST OF ELECTIVES

GROUP - A

EE E71  Analog and Digital Filters
EE E72  Computer Aided Planning and Drafting
EE E73  Data Structures and Algorithms
EE E74  Digital Control Systems
EE E75  Digital System Design Using VHDL
EE E76  Fuzzy and Neural Systems
EE E77  High Power Solid State Systems
EE E78  High Voltage Engineering
EE E79  Information Technology
EE E710 Power System Economics

GROUP - B

EE E81  Advanced Control Engineering
EE E82  Biomedical Instrumentation
EE E83  Computer and Communication Networks
EE E84  Design and Layout of Power Apparatus and Systems
EE E85  DSP Techniques for Speech and Image Processing
EE E86  Embedded System Design
EE E87  FACTS Controllers
EE E88  HVDC Transmission
EE E89  Power System Restructuring and Deregulation
EE E810 Special Electrical Machines
UNIT I  
**Calculus:** Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

UNIT II  
**Multiple Integrals and Applications:** Multiple integrals – change of order of integration. Applications: Areas (double integration) and volumes by triple integration (Cartesian and polar) – mass and center of mass (constant and variable densities).

UNIT III  
**Analytical Solid Geometry:** Directional cosines and ratios – angle between two lines – the equation of plane - equations to a straight line and shortest distance between two skew lines.

UNIT IV  
**Differential Equations:** Exact equations, First order linear equations, Bernoulli’s equation, orthogonal trajectories, growth and decay, geometrical applications and electric circuits. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut’s type.

UNIT V  
**Differential Equations (Higher order):** Linear differential equations of higher order – with constant coefficients, the operator D - Euler’s linear equation of higher order with variable coefficients - simultaneous linear differential equations – solution by variation of parameters method – simple applications to electric circuits.

**Text Book**  

**Reference Book**  
T102 PHYSICS

UNIT I
Acoustics and NDT: Ultrasonics - Ultrasonic Waves Productions (Piezoelectric and Magnetostriction method) – Detections (Acoustic Grating)
Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine’s formula for Reverberation Time . NDT applications - Pulse Echo Method - Liquid Penetrant Method

UNIT II

UNIT III

UNIT IV

UNIT V

Text Books

Reference Books

http://eee.pec.edu
T103 CHEMISTRY

UNIT I

UNIT II

UNIT III
Electrochemical Cells: Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes-hydrogen calomel, Ag /AgCl and glass electrodes. Batteries - primary and secondary cells, lacamacte cell, lead acid storage cell, Ni-Cd battery and alkaline battery. Fuel cells - H_2-O_2 fuel cell.

UNIT IV

UNIT V
Phase Rule: Definition and derivation of phase rule. Application to one component system - water and sulphur systems. Thermal analysis, condensed phase rule. Two component alloy systems - Pb-Ag, Cu-Ni and Mg-Zn systems.

Text books

Reference Books
T 110 BASIC CIVIL AND MECHANICAL ENGINEERING

PART-A CIVIL ENGINEERING

UNIT I
Buildings, Building Materials: Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses.

UNIT II

UNIT III

PART - B MECHANICAL ENGINEERING

UNIT IV
Internal and External Combustion Systems: Working principles of IC engines – Classification – Diesel and petrol engines: two stroke and four stroke engines. Steam generators(Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories.

UNIT V
Casting : Green and dry sand moulding processes for ferrous and non-ferrous metals – applications.

UNIT VI
Metal Joining: Elements of arc and gas welding, brazing and soldering – Bolted joint types – Adhesive Bonding; classification of adhesives – applications. Sheet Metal Processing- Punching, blanking, shearing, bending, and deep drawing processes; descriptions and applications.
Text Books:

Reference Books
T111 ENGINEERING MECHANICS

UNIT I
**Fundamental of Mechanics:** Basic Concepts Force System and Equilibrium, Definition of Force, Moment and Couple, Principle of Transmissibility, Varignon’s theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, concept of free body diagrams, applications in solving the problems on static equilibrium of bodies.

UNIT II
**Plane Trusses:** Degrees of freedom, Types of supports and reactions, Types of loads, Analysis of Trusses-method of joints, method of sections
**Friction:** Introduction, Static dry friction, simple contact friction problems, ladders, wedges, screws and belt friction.

UNIT III
**Properties of Surfaces:** Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

UNIT IV

UNIT V
**Kinematics and Kinetics of Rigid bodies:** Plane motion, Absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

**Text Books**

**Reference Books**

http://eee.pec.edu
UNIT I
Basic Communication Theory: Importance of Communication – stages of communication, modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective listening skills.

UNIT II
Comprehension and Analysis: Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context- Intensive Reading and Reviewing

UNIT III
Writing: Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary Writing – Four modes of writing – Use of dictionaries, indices, library references – making bibliographical entries with regard to sources from books, journals, internet etc.

UNIT IV

UNIT V

Reference Books:
P104 PHYSICS LABORATORY

List of experiments (Any 10 Experiments)

1. Thermal conductivity – Lee’s DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton’s rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly’s experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber

P105 CHEMISTRY LABORATORY

List of experiments (Any 10 Experiments)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry.

Demonstration Experiments( Any two of the following )

1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry.
P106 WORKSHOP PRACTICE

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<th>Sl.No.</th>
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<tr>
<td>1.</td>
<td>Fitting</td>
<td>Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.</td>
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<tr>
<td>2.</td>
<td>Welding</td>
<td>Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints – Demonstration of gas welding</td>
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<tr>
<td>4.</td>
<td>Carpentry</td>
<td>Study of tools and Machineries – Exercises on Lap joints and Mortise joints</td>
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</table>

LIST OF EXERCISES

I Fitting

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

II Welding

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc)

III Sheet metal work

1. Study of tools and machineries
2. Funnel
3. Waste collection tray

IV Carpentry

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint.
UNIT I

Algebra: Binomial, exponential and logarithmic series (without proof) – problems on summation, approximation and coefficients.

UNIT II


UNIT III

Trigonometry: Expansions for sin^n θ, cos^n θ, tan^n θ, sin (nθ), cos(nθ), tan(nθ). Exponential, circular, hyperbolic, inverse hyperbolic and logarithmic functions of a complex variable – separation of real and imaginary parts.

UNIT IV

Vector Analysis: Scalar fields and Vector fields – Gradient, Divergence and Curl – their properties and relations – Gauss and Stokes theorems (without proof), simple problems for their verification.

UNIT V

Statistics: Moments, kurtosis and skewness based on moments only. Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions. Correlation and regression – rank correlation.

Text Books:


Reference Book:
T108 MATERIAL SCIENCE

UNIT I
Crystal Structure and Defects: Crystal Systems – Bravais Lattices – Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices for a cubic crystal– Powder X Ray Diffraction Method - Lattice defects – Qualitative ideas of point, line, surface and volume defects

UNIT II

UNIT III

UNIT IV

UNIT V
Advanced Materials: Liquid Crystals – Types – Application as Display Devices – Metallic Glasses – Nanomaterials (one, Two & three Dimensional) – Physical Properties and Applications of Carbon Nano Tubes

Text books:

Reference Books:
T109 ENVIRONMENTAL SCIENCE

UNIT I

UNIT II

UNIT III
Air Pollution: Air pollution-sources of air pollution. Sources, effects and control measures of oxides of nitrogen, oxides of sulphur, oxides of carbon, hydrocarbon, chlorofluoro carbons and particulates. Green house effect-causes and effects on global climate and consequences. Ozone depletion-causes, mechanism and effect on the environment. Smog-sulfurous and photochemical smog-effect on the environment. Acid rain-theory of acid rain and effects.

UNIT IV
Water Pollution and Solid Waste Management Sources: effects and control measures of—water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and radioactive pollution. Solid waste management—causes, effect and control measures of urban and industrial wastes.

UNIT V
Text Books:


Reference Books:

2. G. S. Sodhi, Fundamental concepts of environmental chemistry, Narosa publishing house, New Delhi
T104 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

PART A – ELECTRICAL

UNIT – I

UNIT – II
Node and mesh methods of analysis of DC circuits and simple AC circuits - Introduction to three phase circuits, Introduction to three phase system - phase and line parameters – relations, power measurement – voltmeter and ammeter method, two and three wattmeter methods.

UNIT – III
Principle of DC generator and motor - Transformer, synchronous generator, induction motor (single phase). Sources for electrical energy conversion-thermal and hydraulic plant (Block diagram approach only). Components of AC transmission and distributions systems – line diagram.

PART B – ELECTRONICS

UNIT – IV
Half-wave rectifier and Full-wave rectifier- filters - Amplifiers-common emitter and common collector amplifiers- Hartley oscillator and RC phase shift oscillator. Transducers – Resistance temperature detector (RTD) – Linear variable differential transformer (LVDT) - Strain gauge – Piezo electric transducer.

UNIT - V

UNIT - VI
Model of communication system – Analog and digital – Wired and wireless channel. Block diagram of various communication systems – Microwave, satellite, optical fiber and cellular mobile system. Network model – LAN, MAN and WAN – Circuit and packet switching – Overview of ISDN.

Text Books

Reference Books
T105 THERMODYNAMICS

UNIT I
Basic Concepts and Definitions: Energy conversion and efficiencies - System, property and state - Thermal equilibrium - Temperature - Zeroth law of Thermodynamics.

UNIT II
First Law of Thermodynamics: The concept of work and adiabatic process - First law of thermodynamics - Conservation of Energy principle for closed and open systems - Calculation of work for different processes of expansion of gases

UNIT III

UNIT IV
Gas Power Cycles: Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and Bryton cycles and their efficiencies

UNIT V
Refrigeration Cycles and Systems: Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system (only theory)- Liquifaction and solidification of gases

Text Books:

Reference Books:
T106 COMPUTER PROGRAMMING

UNIT – I

UNIT – II
Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code. Introduction to C – C tokens – data types – Operators and expressions – I/O functions

UNIT – III
Decision making statements – branching and looping – arrays – multidimensional arrays – Functions – Recursion – Passing array to functions
Storage classes – Strings – String library functions

UNIT – IV
Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types– Union
Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and structures

UNIT – V
Files – operations on a file – Random access to files – command line arguments
Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives

Text Books

Reference Books
P101 COMPUTER PROGRAMMING LAB

List of Exercises

OS Commands, Word Processor and Spreadsheets

1. Study of OS commands-Compilation and execution of simple C programs
2. Use of mail merge in word processor
3. Use of spreadsheet to create Charts(XY, Bar, Pie) and apply the formulae wherever necessary. C Programming (Flowcharts and algorithms are essential for the programming exercises)
4. Greatest of three numbers using conditional operator and if statement
5. Read two numbers and swap those two numbers using temporary variable and without using temporary variable.
6. Solve quadratic equation for different sets of inputs.
7. Use of Switch….Case statements
8. Generation of prime and Fibonacci series
9. Evaluate the COSINE series using for, while and do..while loops
10. Matrix operations
   1. Addition
   2. Transpose
   3. Multiplication
11. Evaluate the sin(x) series using functions and recursive functions
12. Read a string and find solution to remove the duplicates of a given string from the given sentence
Create an array of structures for a list of items with the following details

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<thead>
<tr>
<th>Item_Code</th>
<th>Item_Name</th>
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<tbody>
<tr>
<td>102</td>
<td>Paste – Colgate</td>
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<tr>
<td>102</td>
<td>Paste – Pepsodent</td>
</tr>
<tr>
<td>102</td>
<td>Paste – Close-up</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Cinthol</td>
</tr>
<tr>
<td>101</td>
<td>Soap – Lux</td>
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<td>Soap – Hamam</td>
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<tr>
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<td>Soap – Dove</td>
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<td>102</td>
<td>Paste – Close-up</td>
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</table>

14. Use of Structure to define a user defined data types, input the data and write the data into the file
15. Use of pointers and array of pointers
16. Functions with static data types
17. Write command line program to implement the following DOS commands using files
   - Del
   - Copy
P102 ENGINEERING GRAPHICS

Unit 0

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

Unit I

Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and Planes

Unit II

Projection of Solids and Sections of Solids.

Unit III

Development of surfaces - Intersection of surfaces (cylinder-cylinder, cylinder-cone)

Unit IV

Isometric projections and Orthographic projections

Unit V

Computer Aided Drafting: Introduction to Computer Aided Drafting hardware - Overview of application software - 2D drafting commands (Auto CAD) for simple shapes - Dimensioning.

Text Books

Reference Books
P103 BASIC ELECTRICAL AND ELECTRONICS LAB

ELECTRICAL LAB
1. Study of tools and accessories
2. Study of joints
3. Staircase wiring
4. Doctor’s room wiring
5. Godown wiring
6. Tube Light and Fan connection
7. Lamp controlled from three different places-wiring

ELECTRONICS LAB
1. Rectifiers
   Construction of half wave and full wave rectifiers with and without filters – Calculation of ripple factors.

2. Frequency Response of RC Coupled Amplifiers
   Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.

3. Verification of Kirchoff’s Voltage and Current Laws
   Determine the voltage and current in given circuits using Kirchoff’s laws theoretically and verify the laws experimentally.

4. Study of Logic Gates
   1. Verification of Demorgan’s theorems
   2. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D
   3. Implementation of digital functions using logic gates

5. Study of CRO
   1. Measurement of AC and DC voltages
   2. Frequency and phase measurements (using Lissajou’s figures)

6. Study of Transducers
   1. Displacement and load measurements with transducers
   2. Temperature measurement with thermocouple
P107 NCC / NSS

NCC/NSS training is compulsory for all the Undergraduate students
1. The above activities will include Practical/field activities/Extension lectures.
2. The above activities shall be carried out outside class hours.
3. In the above activities, the student participation shall be for a minimum period of 45 hours.
4. The above activities will be monitored by the respective faculty incharge and the First Year Coordinator.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behaviour. If a candidate Fails, he/she has to repeat the course in the subsequent years
6. Pass in this course is mandatory for the award of degree.
UNIT I: LAPLACE TRANSFORM

UNIT II: FUNCTION OF A COMPLEX VARIABLE
Functions of a complex variable - continuity, derivatives and analytic function - Cauchy - Riemann equations – Necessary and sufficient conditions for analyticity - Harmonic and orthogonal properties of the real and imaginary parts - Conformal mapping - Bilinear transformations.

UNIT III: COMPLEX INTEGRATION
Cauchy's theorem - Cauchy's integral formula - Taylor's and Laurent series - Residue theorem – Contour integration round the units circle and semi-circular Contour.

UNIT IV: FOURIER SERIES

UNIT V: FOURIER TRANSFORM
Fourier Integral Theorems (statements only) - Fourier transform - inverse Fourier transforms, Fourier sine and cosine transforms, definition and properties.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: NETWORK THEOREMS
Review-Loop and Nodal method for DC circuits. Theorems-Thevenin’s, Norton’s, superposition, compensation, Tellegen’s, Reciprocity, maximum power transfer theorems, Millman theorem – Applications to DC circuits.

UNIT II: AC CIRCUITS
Steady state analysis of a.c circuits using loop and nodal methods. Network theorems-Thevenin’s, Norton’s, superposition, maximum power transfer theorems, Millman theorem- Application to AC circuits.

UNIT III: TRANSIENTS
Transient response of RL , RC and RLC circuits to DC excitation-Natural and forced oscillations - ac transients - application of Laplace transform for transient solution.

UNIT IV: RESONANCE AND APPLICATIONS

UNIT V: THREE PHASE CIRCUITS AND NETWORK TOPOLOGY
Solution of 3 phase balanced circuits by node and mesh method and by using single-phase equivalents; power measurement by two-wattmeter method; solution of 3 phase unbalance circuits by node and mesh methods.
Basic concepts of graph theory-tree for two port networks, branch, chord, incidence and reduced incidence matrices-application to network solutions. Link current and tie set, tree branch voltage and cut set, duality and dual networks.

TEXT BOOKS

REFERENCE BOOKS
EE T33 ELECTRICAL MACHINES – I

UNIT I: MAGNETIC CIRCUITS AND TRANSFORMER

UNIT II: POLYPHASE TRANSFORMER
Three phase transformers – Principle - Construction - Poly phase connections – Star, Zigzag, Open-delta, Scott connection, Le Blanc connection-three-phase to single phase conversion – Testing and parallel operation - On load tap changing; Special transformers-variable frequency transformer (VFT), pulse transformer, high frequency transformer

UNIT III: ELECTRO MECHANICAL ENERGY CONVERSION

UNIT IV: DC GENERATOR
DC Generator- Construction – Lap and wave winding – emf equation-excitation and types of generators- Characteristics - armature reaction-methods of improving commutation- testing-power flow diagram-Applications.

UNIT V: DC MOTOR
DC Motor-torque equation – types-back emf and voltage equations-Charateristics- Starting-Speed control- testing-direct, indirect and regenerative tests-Power flow and efficiency-separation of losses-retardation test- Braking - DC machines dynamics; Introduction to solid state power control of DC machines.

TEXT BOOKS

REFERENCE BOOKS
EE T34 ELECTRONIC DEVICES AND CIRCUITS

UNIT I: SEMICONDUCTOR THEORY AND DIODES
Energy band structure of insulators, conductors and semiconductors – conductivity of an intrinsic semiconductor – Fermi Dirac distribution and energy band diagram – Fermi levels in extrinsic semiconductor – Hall effect.

UNIT II: TRANSISTORS
PNP and NPN transistors-current flow-characteristics-transistor parameters-ebbers moll equations -biasing and stabilization of transistor-Operating point – bias stability- different types of bias, fixed bias, collector to base bias and self-bias – stabilization against variation in $V_{BB}$ and $I_{CO}$ – bias compensation. Thermistor and sensistor compensation – thermal runaway and thermal stability

UNIT III: FIELD EFFECT TRANSISTORS
Theory of JFET, characteristics, small signal characteristics and parameters – small signal equivalent circuit – pinch off voltage – MOSFET structure – depletion and enhancement modes of operation – characteristics – biasing of FET.

UNIT IV: POWER DEVICES AND RECTIFIERS
Theory of operation and characteristics of UJT, SCR, TRIAC, DIAC, Power diodes, SCS, GTO, PUJT and IGBT with simple applications Half wave and full wave rectifiers – bridge rectifiers – filter using Inductors and capacitors – multiple LC filters-regulated power supplies – shunt and series voltage regulators.

UNIT V: SPECIAL DEVICES
Construction, Principle of operation, application and characteristics of SchottkyBarrier Diode, Varactor diode, Zener diode, Tunnel diode, PIN Diode.
Photo emissivity and photo electric theory – Theory, construction and characteristics: light emitting diodes, liquid crystal cell, seven segment display, photo conductive cell, photodiode, solar cell, photo transistor, opto couplers and laser diode.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: ELECTROSTATIC FIELD

UNIT II: ELECTROSTATIC APPLICATIONS

UNIT III: STEADY ELECTRO-MAGNETIC FIELDS

UNIT IV: MAGNETO STATICS AND APPLICATIONS

UNIT V: ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION
Conduction current and Displacement current – Maxwell’s equation in point and integral forms – Wave propagation in free space – Wave propagation in Dielectrics – Power and the Poynting Vector – Propagation in good conductors – Wave polarization

TEXT BOOKS

REFERENCE BOOKS
UNIT – I: FLUID MECHANICS

UNIT – II: HYDRAULIC MACHINERY

UNIT – III: STEAM POWER GENERATION

UNIT – IV: INTERNAL COMBUSTION ENGINE AND AIR CONDITIONING

UNIT – V: GAS TURBINES AND AIR COMPRESSORS

TEXT BOOKS

REFERENCE BOOKS
EE P31 ELECTRICAL MACHINES LAB-I
(A minimum of TEN experiments to be conducted in the following Topics)

AC MACHINES
  1. Load test on single/three-phase transformer
  2. O.C and S.C test on single/three-phase transformer
  3. Parallel operation of single/three-phase transformer
  4. Sumpner’s test on single/three-phase transformer
  5. Study of connections STAR/DELTA/Scott connection on single/three-phase transformer

DC MACHINES
  6. Load test on DC Motor (Shunt/series/Compound Motors)
  7. Load test on DC Generators (Shunt/series/Compound Motors)
  8. O.C.C of D.C Generators (shunt/separately)
  9. Swimburne’s/Hopkinsen’s test on DC Machines
 10. Study on Retardation test and Speed control of DC Motors.

EE P32 ELECTRONICS LAB – I
(A minimum of TEN experiments to be conducted in the following Topics)

DEVICE CHARACTERISTICS
  2. Characteristics of a BJT (common base/Emitter/Collector)
  3. Characteristics of a UJT/FET/IGBT.

BIASING AND APPLICATIONS
  6. Biasing Techniques for BJT(Fixed/collector to base/voltage divider biasing)
  7. Biasing Techniques FET.
  8. Rectifiers and Filters.
  9. Diode clippers and clamping circuits.
EE P33 FLUID AND THERMAL MACHINES LAB

(A minimum of TEN experiments to be conducted in the following Topics)

1. Determination of co-efficient of discharge of venture-meter / orifice-meter.
2. Determination of friction factor and minor losses due to pipe implements.
3. Determination of force due to Impact of jet on vanes.
5. Performance characteristics of Turbine (Pelton Wheel/Francis Turbine).
7. Performance test of a Reciprocating air compressor.
8. Testing of IC engine with an AC generator loading.
UNIT I: PARTIAL DIFFERENTIAL EQUATIONS
Formation by elimination of arbitrary constants and arbitrary functions - General, singular, particular and complete integrals - Lagrange's linear first order equation - Higher order differential equations with constant coefficients.

UNIT II: SOLUTIONS TO PARTIAL DIFFERENTIAL EQUATIONS
Solution of partial differential equation by the method of separation of variables - Boundary value problems - Fourier series solutions - Transverse vibration of an elastic string.

UNIT III: HEAT FLOW EQUATIONS
Fourier series solution for one dimensional heat flow equation - Fourier series solutions for two-dimensional heat flow equations under steady state conditions (Cartesian and polar forms)

UNIT IV: APPLIED STATISTICS
Curve fitting method of least squares - fitting of straight lines, second-degree parabolas and more general curves. Test of significance; Large samples test for single proportions, differences of proportions, single mean, difference of means, difference of standard deviations.

UNIT V: CORRELATIONS AND FITNESS
Small samples: Test for single mean, difference of means and correlations coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

TEXT BOOKS

REFERENCE BOOKS
B.Tech (EEE) Curriculum & Syllabus

EE T42 Electrical Machines – II

UNIT I: THREE PHASE INDUCTION MOTOR

UNIT II: INDUCTION MOTOR STARTING AND SPEED CONTROL

UNIT III: SYNCHRONOUS GENERATOR
Types, construction and principle of operation - emf equation- winding factor , effect of chording and winding distribution- armature reaction, causes for voltage variation - regulation by synchronous impedance, MMF and Potier triangle methods - load characteristics.
Parallel operation of synchronous generators, Synchronizing to infinite bus-bars- power transfer equations, capability curve- two reaction model of salient pole synchronous machines and power angle characteristics - determination of $X_d$ & $X_q$ by slip test- Short circuit transients in synchronous machine.

UNIT IV: SYNCHRONOUS MOTOR

UNIT V: SINGLE PHASE AND SPECIAL MACHINES
Single phase induction motors – Rotating magnetic Vs alternating magnetic field - Double revolving field theory – Torque-speed characteristics - types.

TEXT BOOKS

REFERENCE BOOKS
B.Tech (EEE) CURRICULUM & SYLLABUS

EE T43 ELECTRONIC CIRCUITS

UNIT I: SMALL SIGNAL AMPLIFIERS
Two port devices and hybrid model – transistor hybrid model and h parameters -
determination of h-parameters from the characteristics – Analysis of transistor amplifier
using h-parameters – emitter follower -comparison of transistor amplifier configurations –
CE amplifier with an emitter resistance;
Low frequency FET model –Common Source and Common drain amplifiers.

UNIT II: MULTI STAGE AMPLIFIERS
Cascading amplifiers – direct coupled and capacitor coupled two stage CE amplifiers –
Differential amplifier - Darlington Pair - Cascode Amplifier- Tuned Amplifiers - single
 tuned –double tuned -stagger tuned amplifiers.

UNIT III: LARGE SIGNAL AMPLIFIERS
Classification of Power amplifiers - Class A Power Amplifier- direct and Transformer
coupled amplifiers; - Class B - Push-pull arrangements & Complementary symmetry
amplifiers; Conversion efficiency calculations, cross over distortion – Class AB amplifier -
Amplifier distortion – Power transistor heat sinking – Class C and D amplifiers.

UNIT IV: Feedback Amplifiers
Feedback concept – Barkhausen criterion – Gain with feedback – General characteristics of
negative feedback amplifiers – Four basic types of feedback and effect on gain – Input and
output resistances – Multistage feedback amplifiers – Frequency response and stability.

UNIT V: Oscillators
Conditions for oscillations – LC oscillators – Analysis of Hartley, colpitt and tuned
oscillators – R.C. oscillators – Phase shift and wein bridge types and analysis of these
circuits – Crystal oscillators and frequency stability – UJT relaxation oscillators

TEXT BOOKS

REFERENCE BOOKS
1. David. A. Bell, “Electronic Devices and Circuits”, PHI Learning Private Ltd, India, 4th
EE T44 LINEAR CONTROL SYSTEM

UNIT I: INTRODUCTION
Introduction to control systems – Control theory concepts - Open loop and feedback control systems – Mathematics modeling of control systems – Analysis of control systems using Laplace transforms – Block diagram reduction techniques – Signal flow graphs. Controller components - types.

UNIT II: TIME RESPONSE ANALYSIS

UNIT III: ROOT – LOCUS AND FREQUENCY RESPONSE ANALYSIS
Root locus concepts - Construction of root loci – Root contours
Time and frequency response correlation – Polar plot – Bode plot – All pass minimum phase and non-minimum phase systems.

UNIT IV: SYSTEM STABILITY

UNIT V: STATE SPACE ANALYSIS OF LINEAR CONTINUOUS SYSTEMS
Introduction - State space representation using physical variables – Phase variables and canonical variables – Derivation of transfer function from state model – Solving the time invariant state equation – State transition Matrix – Its properties and computation. Introduction to controllability and observability

TEXT BOOKS

REFERENCE BOOKS
EE T45 PULSE AND DIGITAL CIRCUITS

UNIT I: COMBINATIONAL CIRCUITS

UNIT II: SEQUENTIAL CIRCUITS
Memory types and terminology – ROM – RAMs –Non-volatile RAMS – Sequential memories

UNIT III: DESIGN OF SEQUENTIAL CIRCUITS

UNIT IV: LINEAR WAVE SHAPING CIRCUITS:
Linear wave shaping circuits: RC, RL and RLC circuits – Pulse transformer – Steady state switching characteristics of devices – Clipping and clamping circuits – Switching circuits.

UNIT V: MULTI-VIBRATORS AND TIME BASE CIRCUITS:

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION TO OOP
Limitations of structure programming - Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OO methodology - Data types - loops - pointers –arrays – structures – functions – Classes – Objects- Constructor and destructor

UNIT II: OVERLOADING FUNCTIONS AND FILES

UNIT III: INTRODUCTION TO JAVA

UNIT IV: PACKAGES AND EXCEPTION HANDLING
Inheritance- Packages – API packages – creating packages – adding class to package - interfaces –multiple inheritance - Exception handling- predefined and user defined.

UNIT V: THREADS AND APPLETS (Qualitative Analysis)
Multithreaded programming –creating threads- extending the thread class- life cycle of threads- Applet Programming – applet life cycle-creating executable applet – passing parameters to applets - Streams in Java.

TEXT BOOKS

REFERENCE BOOKS
**EE P41 ELECTRICAL MACHINES LAB – II**  
*(A minimum of TEN experiments to be conducted in the following Topics)*

**INDCUTION MACHINES**  
1. Load test on 3 phase squirrel cage/ slip ring Induction Motor  
2. No load & Blocked rotor test on 3-phase squirrel cage Induction Motor (Performance determination using equivalent circuit and circle diagram)  
3. Load test on 1 phase Induction Motor  
4. Load test on 3 phase Induction Generator  
5. Study of speed control of Induction Motor  

**SYNCHRONOUS MACHINES**  
6. Load test on 1/3 phase Alternator  
7. Pre-determination of voltage regulation of 3 phase Alternator by EMF/MMF/ZPF Method.  
8. Synchronization/parallel operation of Alternators.  
9. V and inverted V curve of an auto synchronous motor and observation on reactive power  
10. Determination Direct axis reactance and quadrature axis reactance of a salient pole Alternator by slip test.

**EE P42 ELECTRONICS LAB – II**  
*(A minimum of TEN experiments to be conducted in the following Topics)*

**ANALOG CIRCUIT APPLICATIONS**  
1. Frequency response characteristics of a single stage RC Coupled Amplifier  
2. Design verification of Oscillator (RC phase shift/UJT Relaxation Oscillator)  
3. Design verification Schmitt Trigger  
4. Design verification Multivibrator (Astable/Bistable)  
5. Design and characterization of Power Amplifiers.

**DIGITAL CIRCUIT APPLICATIONS**  
6. Study of logic gates (verification of De’Morgans laws/basic gates using universal gates)  
7. Study and design of flip-flops using universal gates (RS/D/T/JK)  
8. Master slave flip-flops using logic gates.  
10. Multiplexer and De-Multiplexer.  

**EEP43 OBJECT ORIENTED PROGRAMMING LAB**  
*(A minimum of TEN experiments to be conducted in the following Topics)*

**PROGRAMS IN C++ / JAVA**  
1. Classes and objects, Constructor and Destructors.  
2. Function Overloading.  
3. Inheritance.  
4. Operator overloading.  
5. Friend function, Templates.  
7. Simple Package creation - Developing user defined packages in Java.  
8. Interfaces in JAVA.  
10. Exception Handling Mechanism in Java - Handling pre - defined exceptions - Handling user-defined exceptions.  
11. Applets creations.
SP P44 PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students and a Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports / extension lectures. The student participation shall be for a minimum period of 45 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass /Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.
UNIT I: THEORY OF EQUATIONS
Relation between the roots and the coefficient of an equation - Calculation of symmetric functions of the root of an equation - Transformation of equations - Reciprocals of the roots - Reciprocal equation - Roots of given equation multiplied by a constant m - Equations whose roots are diminished by the same quantity - Horner's method.

UNIT II: LINEAR EQUATIONS AND SOLUTIONS
Series to second order linear equations with ordinary points and regular singular points (Erogenous method).

UNIT III: FUNCTIONS AND POLYNOMIALS
Bessels functions and Legendre polynomials - series solutions - Generating functions - Recurrence relations at orthogonal property.

UNIT IV: STOCHASTIC PROCESSES

UNIT V: CONTINUOUS PARAMETER MARKOV CHAINS
The birth and death process (M/M/I, M/M/C, M/M/I/N, M/M/C/N (where C < N)), M/M/C/C, M/M/∞ models only, derivation of mean number of customer in a system - in the queue and waiting time – simple applications – pure birth and pure death process.

TEXT BOOKS

REFERENCE BOOKS
EE T52 ANALOG AND DIGITAL INTEGRATED CIRCUITS

UNIT I: IC FABRICATION:
Monolithic IC technology – planar process – Bipolar junction transistor – FET fabrication – CMOS technology.
DIGITAL IC’s. Logic families; DTL, HTL, RTL, TTL, ECL, PMOS, CMOS, I^2L performance criteria - Comparison, applications, advantages.

UNIT II: OPERATIONAL AMPLIFIERS:

UNIT III: ANALOG IC APPLICATIONS
Series op-amp regulator – IC voltage regulator – Switching regulator – Digital to analog converters – Analog to digital converter – Voltage to frequency converter – Frequency to voltage converter – Active filters – State variable filter.

UNIT IV: PHASE LOCKED LOOP AND TIMER
Phase comparator - PLL block diagram - lock range and capture range - PLL applications. IC timer - design of Astable, monostable Schmitt trigger, missing pulse detector using 555 timer - dual timer - Applications.

UNIT V: SYSTEM DESIGN

TEXT BOOKS

REFERENCE BOOKS
4. B.S. Sonde, "Introduction to system design using IC's Wiley eastern, 2008
EE T53 TRANSMISSION AND DISTRIBUTION

UNT I: DISTRIBUTION SYSTEMS
Structure of electric power systems - one Line Diagram - generation, transmission and distribution systems, comparison of distribution systems – radial and ring – two wire dc, ac single phase and three phase systems – current and voltage calculations in distributors with concentrated and distributed loads – Kelvin’s law for the design of feeders and its limitations.

UNIT II: TRANSMISSION LINE PARAMETERS
Resistance, inductance and capacitance of single and three phase transmission lines - symmetrical and unsymmetrical spacing – transposition - single and double circuits - stranded and bundled conductors - application of self and mutual GMD – Skin and Proximity effect - inductive interference - Corona - characteristics.

UNIT III: PERFORMANCE OF TRANSMISSION LINES
Development of equivalent circuits for short, medium and long lines – efficiency and regulation - attenuation constant and phase constant - surge impedance loading - power circle diagrams for sending and receiving ends - transmission capacity, steady state stability limit – voltage control of lines - shunt and series compensation.

UNIT IV: INSULATORS AND CABLES

UNIT V: RECENT TRENDS IN TRANSMISSION

TEXT BOOKS

REFERENCE BOOKS
EE T54 POWER ELECTRONICS

UNIT I: POWER SEMI CONDUCTOR DEVICES
Power switching devices overview: ideal & real switching characteristics - power diode, BJT, SCR, TRIAC, MOSFET, GTO, IGBT- V-I characteristics, turn-on, turn-off methods; Protection-di/dt, dv/dt, over current, over voltage; specifications, losses, thermal characteristics, series and parallel operation, triggering circuits.

UNIT II: CONTROLLED RECTIFIERS
Operation and analysis of single and three phase rectifiers – half and fully controlled converters with R, RL and RLE loads with and without freewheeling diodes; converter and inverter operation – waveforms, gate time control, output voltage, input current, power factor, effect of load and source inductances.
Power factor and harmonic improvement methods: multi-phase width controlled symmetrical angle controlled; series converter, twelve pulse converters; converter modes–four-quadrant operation with and without circulating current; firing circuits.

UNIT III: CHOPPERS
Principles of high power chopper circuits – voltage commutated, current commutated chopper, multi-phase chopper, multi-quadrant operation, switched mode regulators – principle of operation of buck, boost and buck boost regulators; time ratio control, variable frequency control, duty cycle.

UNIT IV: INVERTERS
Principles of high power VSI and CSI inverters, Modified McMurray, auto sequential inverter– waveforms at load and commutating elements; inverters: analysis of three phase inverter circuits with star and delta loads; control and modulation techniques: unipolar, bipolar schemes– voltage and frequency control; harmonics study.

UNIT V: AC CHOPPER AND CYCLO CONVERTERS
Principle of single phase and three-phase AC voltage controller – ON/OFF and phase angle control; principle of single phase and three phase cycloconverters circuits, different control techniques and firing pulse generation. Higher applications – regulated power supply, UPS, solid-state motor starters, static circuit breakers, HVDC systems, reactive power compensation.

TEXT BOOKS

REFERENCE BOOKS

Pondicherry University: B.Tech EEE Curriculum for 1 to 8 Semesters 47
EE T55 MEASUREMENTS AND INSTRUMENTATION

UNIT I: INTRODUCTION TO MEASUREMENT
Elements of Generalized measurement system - Methods of measurement - Classification of instruments – Static & Dynamic characteristics of instruments - Mean, Standard deviation- Probability of errors - Types of error Accuracy, Precision, Sensitivity, Linearity, Resolution, Hysteresis, Threshold, Input impedance, loading effects.

UNIT II: ELECTRICAL MEASURING INSTRUMENT

UNIT III: AC MEASUREMENT & MAGNETIC MEASUREMENTS
Measurement of resistance- Low Medium and High- AC bridges - Maxwell’s, Hay’s Anderson’s for L Desauty’s bridge and Schering bridge for C and Wien’s bridge for measurement of frequency. B-H curve and hysteresis loop using ballistic galvanometer, and Loss measurement using wattmeter method.

UNIT IV: DISPLAY AND RECORDING DEVICES
LED & LCD Display Dot Matrix Display, 7 Segment Display Strip Chart Recorders Single point and multi point Recorders – X-Y Recorders - Magnetic Tape Recorders - Data Loggers – Electromagnetic and Electrostatic interference

UNIT V: TRANSDUCERS

TEXT BOOKS

REFERENCE BOOKS
EE T56 COMMUNICATION ENGINEERING

UNIT I: MODULATION SYSTEMS
Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

UNIT II: TRANSMISSION MEDIUM
Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

UNIT III: DIGITAL COMMUNICATION

UNIT IV: DATA COMMUNICATION AND NETWORK PROTOCOL
Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V: SATELLITE AND OPTICAL FIBRE COMMUNICATIONS
Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fibre communication - Light propagation through fibre, fibre loss, light sources and detectors.

TEXT BOOKS

REFERENCE BOOKS
EE P51 ELECTRONICS LAB – III

(A minimum of TEN experiments to be conducted in the following Topics)

ANALOG IC APPLICATIONS
1. Series and shunt voltage regulators/IC 723 voltage Regulator
2. Design and characterization of amplifiers using IC 741 (Inverting/Non-Inverting/Amplifiers and voltage follower).
3. Design and characterization of log and anti log amplifiers.
4. Differentiator and Integrator using IC 741.
5. Amplifier Application using 741 (Sum/Difference/Error Amplifier)
6. Comparator Application using 741 (Comparator/Regulator (PWM/SPWM)).
7. Frequency Response of Active Filters (first/second order filters).
8. Wein-Bridge oscillator using IC 741.
9. IC 555 – Monostable and Astable operation

DIGITAL IC APPLICATIONS
10. MOD/Decade counters.
11. Multiplexer and De-Multiplexer.
Digital comparator and parity generator/checker circuits.
13. Encoders and Decoders.
14. Monostable and Astable Multivibrators using gates and ICs.
15. Digital to Analog converters.

EE P52 MEASUREMENT AND CONTROL LAB

(A minimum of TEN experiments to be conducted in the following Topics)

MEASUREMENTS AND CALIBRATION
2. Verification of network theorems (Simulation/Practical method).
3. Extension of range and Calibration of electrical meters (voltmeter/ammeter/energy meter).
4. Measurements on supply systems (frequency/phase/phase sequence).
5. Measurement Magnetic (Flux density(B)/Field intensity (H)/B-H loop/Magnetic Losses).
6. Operation amplifier application to M&I (Instrumentation amplifier/Signal converter with grounded and floating loads).

CONTROLS
7. Measurement parameters to model the electrical machines using the transfer-function method.
9. Verification of various exercises and plots in control system using simulation.
10. Stability analysis of a system using simulation.
11. Servo control application for tracking and positioning.
UNIT I: ART OF COMMUNICATION
Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

UNIT II: INTRODUCTION TO SOFT SKILLS

UNIT III: WRITING
Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

UNIT IV: SPEAKING PRACTICE

UNIT V: APTITUDE
Verbal - non verbal - Numerical aptitude

REFERENCE BOOKS
EE T61 POWER SYSTEM ANALYSIS

UNIT I: POWER SYSTEM MODEL
Representation of Power system components like synchronous machines, induction machines, transformers, transmission lines, loads etc, for steady state analysis - Per unit Quantities, Impedance and reactance diagram - Formulation of network matrices for the power systems - Bus impedance and bus admittance matrices, reduction techniques on network matrices for network changes – Case study.

UNIT II: LOAD FLOW ANALYSIS
Formulation of load flow equations - Solution of simple problems by considering voltage controlled buses, tap changing transformers, phase shift control, line flow calculations - Effect due to new lines, loads and voltages - Gauss, Gauss-Seidel method, Newton-Raphson - Jacobian and Fast Decoupled method for calculating line voltages and real and reactive powers – Case study.

UNIT III: SYMMETRICAL COMPONENTS
Definition - Introduction - Review of symmetrical components - Transformation matrices used in resolution of unbalanced voltages and currents - Positive, Negative and Zero sequence networks of power system components - Sequence networks of impedance loads, Series impedance and Rotating machines - Representation of various types of faults in sequence networks – Case Study.

UNIT IV: SHORT CIRCUIT ANALYSIS

UNIT V: STABILITY ANALYSIS

TEXT BOOKS

REFERENCE BOOKS
UNIT I: ILLUMINATION

UNIT II: ELECTRIC HEATING AND WELDING

UNIT III: ELECTRIC DRIVES AND CONTROL

UNIT IV: ELECTRIC TRACTION
Traction system – Speed time characteristics – Series and parallel control of D.C motors - Open circuited, shunt and bridge transitions – Tractive effort calculation – Electric braking – Tramways and trolley bus – A.C traction and recent trend.

UNIT V: ELECTROLYTIC PROCESSES

TEXT BOOKS

REFERENCE BOOKS
EE T63 MICROPROCESSORS AND APPLICATIONS

UNIT I: MICROPROCESSORS ARCHITECTURES
Basic Microprocessor – Registers, Arithmetic and logic section, Timing and Control section and Interface section – 8085/Z80/MC6800 microprocessor.

UNIT II: 8085 PROGRAMMING
Addressing modes-Condition flags-Instruction set – Programming techniques – Arithmetic and logic operations on 8/16 bit binary/BCD numbers, Counter and time delay programs – Stack and subroutines – Code conversion. Software development systems and assemblers.

UNIT III: MEMORY I/O INTERFACING AND INTERRUPTS
Memory Interfacing-Compatibility between memory and microprocessor unit –Address space –Partitioning of address space–Interfacing input devices. Types of data transfer –8085 Interrupt structure-vectorized interrupts –Interfacing data converters.

UNIT IV: PROGRAMMABLE PERIPHERAL DEVICES AND SERIAL I/O
Study of Architecture and programming of ICs: 8255 Programmable Peripheral device, 8253 Timer/ Counter, 8279 Programmable keyboard display interface - Interfacing keyboard – Interfacing displays, 8259 Programmable interrupt controller. Serial mode of data transfer - 8251 USART

UNIT V: APPLICATIONS AND MICROCONTROLLER

TEXT BOOKS

REFERENCE BOOKS
EE T64 ELECTRICAL MACHINE DESIGN

UNIT I: INTRODUCTION

UNIT II: DC MACHINES

UNIT III: TRANSFORMERS
Constructional details-Classification – output equation - Core section - Window dimensions - Yoke dimension - Overall dimension - Determination of number of turns and length of mean turns of windings- Resistance of windings- Leakage reactance- No load current calculation – Regulation, losses and efficiency.

UNIT IV: INDUCTION MOTORS

UNIT V: ALTERNATORS

TEXT BOOKS

REFERENCE BOOKS
EE T65 DIGITAL SIGNAL PROCESSING

UNIT I: DISCRETE TIME SIGNALS AND SYSTEMS

UNIT II: DISCRETE TIME SYSTEM ANALYSIS

UNIT III: DFT AND FFT
Discrete Fourier Transform-properties - relationship between z- transform, DTFT and DFT-Frequency analysis of signal using DFT. FFT algorithms - advantages over discrete computation of DFT – radix 2 algorithms-Decimation In Time-Decimation In Frequency-Computation of IDFT using FFT.

UNIT IV: DESIGN OF DIGITAL FILTERS

UNIT V: FILTER IMPLEMENTATION AND FINITE WORD LENGTH EFFECTS

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION TO ENERGY RESOURCES
World Energy status – Indian scenario, Energy resources – conventional and renewables, fuel cells, hydrogen energy, small hydro resources; Need for energy storage, energy storage methods; Environmental aspects of energy – Economics.

UNIT II: CONVENTIONAL ENERGY SYSTEMS
Coal fired steam thermal power plant – layout, working, T-S diagram of water and steam, rankine cycle for steam turbine, efficiency.
Gas turbine power plant – various options, layout, working and T-S diagram for simple and combined cycle power plant, comparison, efficiency.
Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, nuclear waste management.

UNIT III: HYDRO ELECTRIC TECHNOLOGY
Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects – Hydro-Thermal coordination.
Ocean Energy Technology, Wave and tidal energy - fundamentals - energy converters - power plant - limitations.

UNIT IV: WIND, SOLAR AND BIOMASS ENERGY TECHNOLOGIES
Wind turbine types and construction – power equation – wind energy conversion systems-grid connection - environmental aspects.
Solar energy basics – energy from the sun, solar constant, solar spectrum, clarity index, V-I characteristics of a solar cell – solar module –Solar PV plant – hybrid systems.
Biomass energy resources – conversion technologies – urban waste to energy conversion – Biogas plant

UNIT V: ENERGY CONSERVATION AND MANAGEMENT
Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities.

TEXT BOOKS

REFERENCE BOOKS
EE P61 POWER ELECTRONICS LAB
(A minimum of TEN experiments to be conducted in the following Topics)

POWER CONVERTERS
1. SCR Trigger circuits (using RC, UJT, Counters)
2. Study on DC choppers and forced commutation techniques
3. Study on single phase controlled rectifiers with R, RL & RILE loads
4. Study on three phase controlled rectifiers
5. Study on AC Choppers
6. Study on Inverters
7. Study on Cycloconverters

APPLICATIONS
8. Speed control of AC/DC motors using solid-state devices
9. SCR based motor soft stating circuits (starters) & static circuit breakers
10. Regulated power supply

EE P62 MICROPROCESSOR LAB
(A minimum of TEN experiments to be conducted in the following Topics)

ARITHMETIC OPERATIONS
1. 8/16 bit arithmetic operations using various number systems.
2. Code Conversions.
3. Block operation using pointers
5. Sorting of an Array.

APPLICATION PROGRAMS
9. Digital clock Simulation using counters/interrupts.
10. Waveform generations.

INTERFACES
15. ADC/DAC interface.
UNIT I: COMPOSITION ANALYSIS
Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology

UNIT II: WRITING
Job Application Letter Writing – Resume Writing

UNIT III: ORAL SKILLS
Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

UNIT IV: ADAPTING TO CORPORATE LIFE
Corporate Etiquette – Grooming and Dressing

UNIT V: APTITUDE
Verbal – non verbal - numerical aptitude.

REFERENCE BOOKS
EE T71 INDUSTRIAL MANAGEMENT

UNIT I: PRINCIPLES OF MANAGEMENT
Management concept-Types and principles of management - scientific management- types and functions of organization - merits and demerits- elements of management- planning, organizing, staffing, directing, and control.
Types of ownership-sole proprietorships- partnership- private and public limited companies- Advantages and disadvantages.

UNIT II: FINANCIAL MANAGEMENT
Sources of finance - internal and external - types of investment- Evaluation of Investments-preparation of balance sheet and profit and loss statement - managing working capital-types of accounting and significance of each type-Type of costs, total costs,Average costs, Marginal costs, Break- even analysis.

UNIT III: PRODUCTION AND MATERIALS MANAGEMENT
Types of production -process planning scheduling, Routing- Functions and objects of materials management - stores and material control- Inventory planning and control - functions of inventories.

UNIT IV: SALES AND MARKETING
Core concepts of marketing needs, wants and demand-marketing Vs selling-products and markets- pricing and its related factor- basic concepts in channels of distribution - sales promotion -Advertising-Market research - sales forecasting.

UNIT V: INDUSTRIAL PSYCHOLOGY AND PERSONAL MANAGEMENT
Definition, scope of Industrial psychology - Individual and group-motive and morale. Fatigue, causes and remedy-accidents causes and prevention- manpower planning, job analysis and merit rating- wage and salary administration - causes of Industrial unrest - collective bargaining - (MBO) management by objectives - concepts, advantages and limitations of MBO.

REFERENCE BOOKS
UNIT I: DRIVE CHARACTERISTICS
Characteristics of mechanical system; requirement of drive characteristics; selecting the drive elements; modeling of dc motor; selection of motor rating; P, PI and PID controllers; constant HP and constant torque operations.

UNIT II: DC DRIVES
Single phase and three phase drives - half controlled and fully controlled; Chopper drives - class A, B, C, D and E chopper drives; braking of dc drives.

UNIT III: STATOR SIDE CONTROLLED INDUCTION MOTOR DRIVE
Stator voltage controlled induction motor drive - slip torque characteristics; different configuration of controller's input current; closed loop operation.
Stator frequency controlled induction motor drive - Slip-torque characteristics; harmonic equivalent circuit; Rotating magnetic fields; harmonic current; efficiency; torque; stability.

UNIT IV: ROTOR SIDE CONTROLLED INDUCTION MOTOR DRIVE
Rotor Resistance Control: slip-torque characteristics; equivalent chopper resistance; chopper circuit filter; constant current operation.
Slip Power Recovery Scheme: Slip power recovery scheme; sub synchronous operation; performance prediction; input power factor.

UNIT V: SYNCHRONOUS MOTOR DRIVES
Open loop volts/hertz control and self-control of synchronous motor: Marginal angle control and power factor control.
Introduction to vector control - Principles and types.

TEXT BOOKS

REFERENCE BOOKS
EE P71 POWER SYSTEM SIMULATION LAB

(A minimum of TEN experiments to be conducted in the following Topics)

1. Computation of Power System Components in Per Units.
2. Formulation of the bus admittance matrix by Direct inspection and Singular transformation method.
3. Formation of bus impedance matrix by Inverse matrix by pivotal condensation method.
5. Symmetrical components for different case studies.
7. Numerical Integration of Swing equation.
8. The Equal-Area Criterion.
12. Load Frequency Control.

EE PW7 PROJECT WORK PHASE –I

The objective of the projects is to enable the students to work in convenient group of not more than four members in a group on a project involving analytical, experimental, design combination of these related to one or more areas of Electrical & Electronics Engineering. Each project shall have a guide who is member of faculty of Electrical & Electronics Engineering.

Six periods per week is allotted for the phase-I of the project work. Each group of students should complete the project literature survey, problem statement methodology with few results. The guide and departmental committee shall evaluate the student’s work for 100 marks based on one project presentation and internal viva-voice.

EE P72 SEMINAR

The objective of seminar is to enable the students to work in convenient groups (not more than four members in a group) and present a seminar on any chosen topic connected with Electrical & Electronics Engineering. The topic shall be chosen in consultation with a Faculty member. Each group is expected to make a critical review of literature and prepare a report on the topic. The students are expected to present a seminar. A departmental committee shall evaluate the performance of the students for 100 marks.

EE P73 INDUSTRIAL VISITS/TRAINING REPORT

During the course of study from 3rd to 6th semester each student is expected to undertake a industrial visit and training. The minimum requirements shall be three units. A unit is defined as one industrial visit or one week industrial/field training. The students are expected to submit a report, which shall be evaluated by a Departmental Committee at the end of seventh semester for 100 marks.
EE T81 POWER SYSTEM OPERATION AND CONTROL

UNIT I: SECURITY CONCEPTS
Power system security; Factors affecting system security; Different operating states of power systems; energy control centers and its functions; Necessity for regulation of system frequency and voltage; Power systems control problems; P - F and Q - V control structure; SCADA systems.

UNIT II: LOAD FORECAST AND UNIT COMMITMENT
Load and load duration curves; Load forecasting, components of system load, classification of base load, forecasting of the base load by method of least square fit; Introduction to unit commitments constraints on unit commitment, unit commitment using priority ordering load dispatching and dynamic programming method.

UNIT III: ACTIVE POWER CONTROL
Power control mechanism of individual machine; mathematical model of speed governing mechanism, speed load characteristics of governing mechanism; Regulation of two generators in parallel; Division of power system into control areas; LFC control of a single area; static and dynamic analysis of uncontrolled system; proportional plus integral control of a single area; LFC control of two area system - uncontrolled case, static and dynamic response; Tie line with frequency bias control of two area.

UNIT IV: DISPATCH SCHEDULE
Incremental cost curve, co-ordination equations with losses neglected - solution by iteration; co-ordination equations with loss included (No derivation of Bmn co-efficient); solution of co-ordination equations using Bmn co-efficient by iteration method., Base point and participation factors; Economic dispatch controller added to LFC.

UNIT V: VOLTAGE CONTROL
Fundamental characteristics of excitation system; Block diagram model of exciter system; Generation and absorption of reactive power; methods of voltage control; static shunt capacitor/inductor VAR compensator; tap changing transformer; comparisons of different types of compensating equipment for transmission systems.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION AND GENERAL PHILOSOPHIES

UNIT II: RELAY FUNDAMENTALS AND CHARACTERISTICS
Differential Principle - Over current – Back up Relay- Directional Scheme - Distance Relays – Impedance, Reactance and Mho - Under frequency and Negative sequence Relays - Microprocessor Applications and Substation Automation – Zones of Protection.
Static relay circuits using analog and digital ICs for over current, differential, generator field loss, under frequency, distance, impedance and reverse power relays.

UNIT III: COMPONENTS PROTECTION:

UNIT IV: DESIGN ASPECTS OF CIRCUIT BREAKERS

UNIT V: CIRCUIT BREAKERS

TEXT BOOKS

REFERENCE BOOKS
EE PW8 PROJECT WORK PHASE –II
The objective of the projects is to enable the students to work in convenient group of not more than four members in a group on a project involving analytical, experimental, design combination of these related to one or more areas of Electrical & Electronics Engineering. Each project shall have a guide who is member of faculty of Electrical & Electronics Engineering.

Twelve periods per week is allotted for the phase-II of the project work. Each group of students should complete the project and prepare a report covering literature survey, problem statement methodology, results and conclusions. The guide and departmental committee shall evaluate the student’s work for 50 marks based on one seminar and one internal viva-voice. The student shall take up the viva-voce before a committee comprising of an external and an internal examiner, which evaluates the students work for 100 marks.

EE P81 COMPREHENSIVE VIVA VOICE
A departmental committee for 100 marks for internal assessment evaluates the students on all areas of Electrical & Electronics Engineering. They also shall be examined by a panel of examiners (An internal examiner and an external) on all areas of Electrical & Electronics Engineering at the end of 8th semester.

EE P82 PROFESSIONAL ETHICAL PRACTICE
The course should cover the following topics by way of Seminars, Expert Lectures and

ASSIGNMENTS
1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer’s responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics

REFERENCE BOOKS
EE E71 ANALOG AND DIGITAL FILTERS

UNIT I: INTRODUCTION LTI SYSTEMS

UNIT II: ANALOG FILTER DESIGN

UNIT III: DIGITAL FILTER DESIGN - IIR

UNIT IV: DIGITAL FILTER DESIGN - FIR
Low pass FIR filter design – Band pass High pass filter design – Remez Exchange FIR filter design method – Frequency sampling filter design – Structure of FIR filter – sensitivity and quantization normal study.

UNIT V: POLY PHASE FILTERS
Introduction to multi rate signal processing – Interpolation – Decimation – Sampling rate conversation (I/D) – Poly phase filter structure – Poly phase Implementation – Application of Multirate signal processing

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION TO AUTOCAD

UNIT II: COMMANDS AND VARIABLES
Using commands and systems variables – creating objects – Hatching drawing with previsions – controlling the drawing display – Editing method - using layers and object properties – auditing text to drawing – creating dimensions.

UNIT III: AUTO CAD DESIGN
Using blocks and external reference – management content with auto cad design centre – creating a layout to plot – plotting drawings batch plotting – using scripts files – working three – dimensional space – interactive veering in 3D – creating three – dimensional object

UNIT IV: 3D APPLICATIONS

UNIT V: VISUAL LISP AND AUTO LISP
Creating compound documents with OLD – linking and embedding information –using information from other application in AutoCAD. Accessory external database-working with table data- creating labels – accessing the internet visual Lisp and auto Lisp – VBA and active X automation.

TEXT BOOKS

REFERENCE BOOKS
EE E73 DATA STRUCTURES AND ALGORITHMS

UNIT I: INTRODUCTION TO DATA STRUCTURES
Abstract data types - Sequences as value definitions - Data types in C - Pointers in C - Data structures and C - Arrays in C - Array as ADT - One dimensional array - Implementing one dimensional array - Array as parameters - Two dimensional array - Structures in C - Implementing structures - Unions in C - Implementation of unions - Structure parameters - Allocation of storage and scope of variables. Recursive definition and processes: Factorial function - Fibonacci sequence - Recursion in C - Efficiency of recursion.

UNIT II: STACK, QUEUE AND LINKED LIST
Stack definition and examples – Primitive operations – Example - Representing stacks in C - Push and pop operation implementation. Queue as ADT - C Implementation of queues - Insert operation - Priority queue - Array implementation of priority queue..
Inserting and removing nodes from a list-linked implementation of stack, queue and priority queue - Other list structures: Circular lists: Stack and queue as circular list - Primitive operations on circular lists. Header nodes - Doubly linked lists - Addition of long positive integers on circular and doubly linked list.

UNIT III: TREES

UNIT IV: SORTING AND SEARCHING

UNIT V: GRAPHS

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION
Introduction to discrete time control system - Pulse transfer function – general procedures for obtaining pulse transfer functions-z domain equivalents to s domain – correlation between time response and root location in the z plane – effect of pole zero configuration in z plane – transient response of sampled data systems – steady state error.

UNIT II: STATE VARIABLE TECHNIQUE
State equations of discrete time systems – solution of state equation - state transition matrix, its properties – state space realization and state diagram – pulse transfer function from state equation - characteristic equation - Eigen values - Eigen vectors. Similarity transformation – transformation into various canonical forms.

UNIT III: CONTROLLABILITY, OBSERVABILITY AND STABILITY
Controllability and observability of linear Time Invariant (LTI) discrete data systems – tests for controllability and observability - relationship between controllability, observability and pulse transfer functions

UNIT IV: CONTROLLER DESIGN (CLASSICAL APPROACH)
Transform of digital control systems–design specifications–bilinear transformation and design procedure on the w-plane – Lead, Lag and Lead-Lag compensators - Digital PID controller.

UNIT V: CONTROLLER DESIGN (STATE SPACE APPROACH)
State feedback - Design via pole placement – observer based state feedback – full and reduced order observers.
Optimal state estimation – Kalman filter - Introduction to digital redesign.

TEXT BOOKS

REFERENCE BOOKS
EE E75 DIGITAL SYSTEM DESIGN USING VHDL

UNIT I: IMPLEMENTATION TECHNOLOGY
Programmable logic devices - PLA, PAL, CPLD and FPGA – Custom chips – CAD Tools – design entry, synthesis, functional simulation, physical design, timing simulation, and chip configuration.

UNIT II: VHDL CONCEPTS
VHDL Terms – Behavioral Modeling – Sequential Processing – process statement, signal, variable assignment, sequential statements, and concurrent assignment problem – Data Types.

UNIT III: VHDL PROGRAMMING
Subprograms and Packages – Predefined Attributes – Configurations – VHDL Synthesis – constraints and attributes.

UNIT IV: COMBINATIONAL CIRCUIT DESIGN

UNIT V: SEQUENTIAL CIRCUITS
Synchronous Sequential Circuits – Design steps - state assignment problem- Finite state machines using CAD tools.
Asynchronous Sequential Circuits – asynchronous behavior, analysis, synthesis, concept of stable and unstable states, hazards and design example – Vending machine controller.

TEXT BOOKS

REFERENCE BOOKS
EE E76 FUZZY AND NEURAL SYSTEMS

UNIT I: FUZZY SETS AND RELATIONS
Classical sets, fuzzy sets-operation, properties. Fuzzy relations-Equivalence and tolerance relation, Fuzzification- membership function-types, methods.

UNIT II: FUZZY INFERENCE SYSTEM

UNIT III: INTRODUCTION TO NEURAL NETWORKS
Biological Neuron, artificial neuron-comparison, neuron model, architectures-Feedforward and recurrent types. Perceptron -learning rule-graphical, algorithmn, limitations, multilayer network.

UNIT IV: BACKPROPAGATION NETWORKS

UNIT V: ASSOCIATIVE AND SELF-ORGANIZING NETWORKS

TEXTBOOKS

REFERENCE BOOKS
EE E77 HIGH POWER SOLID STATE SYSTEMS

UNIT I: SOLID STATE COMPENSATORS

UNIT II: HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT
Harmonics and input power factor for different types of converters, power factor improvement using Load and forced commutated converters. Higher pulse converter and their influence on harmonic and power factor of higher pulse converter.

UNIT III: VOLTAGE CONTROL USING STATIC TAP-CHANGERS
Conventional tap changing methods, solid static tap changers – different schemes and their comparison. Calculation – number of transformer taps, output voltage – influence of load power factor.

UNIT-IV: UNIFIED POWER FLOW CONTROLLER
Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

UNIT V: UNINTERRUPTABLE POWER SUPPLY SYSTEM
UPS – various schemes, UPS – converters/inverters used, Filters – tuned filters for current/voltage harmonics. UPS – Parallel, Redundant and non-redundant UPS.

TEXT BOOKS

REFERENCES BOOKS/PAPERS
UNIT I: OVER VOLTAGES AND INSULATION COORDINATION
Causes of over voltages: lightning and switching over voltages; protection against over voltages; principles of insulation coordination.

UNIT II: GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

UNIT III: MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS
Measurement of AC, DC impulse and switching surges using sphere gaps, peak voltmeters, potential dividers and high speed CRO, opto Electronics method; Fiber optic method;

UNIT IV: ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS
Ionization processes - Townsend & Streamer theory - the sparking voltage - Paschen's law - Time lag for breakdown - Breakdown in non-uniform fields and corona discharges. Conduction and breakdown in pure and commercial liquids and solids dielectrics.

UNIT V: HIGH VOLTAGE TESTING PRACTICE
Indian Standards/IEC specification for testing, correction factor; high voltage testing of power apparatus: Insulators, Bushings, Isolators, Circuit Breakers, Cables, Transformers and Surge Diverters.

TEXT BOOKS

REFERENCE BOOKS
EE E79 INFORMATION TECHNOLOGY

UNIT I: INTRODUCTION
Introduction to IT, Scope for IT, IT Usage, Information System, its functions and applications.

UNIT II: HARDWARE:
Architecture (Mainframe, Mini, PC, Workstations), Real time system, Transaction Processing system, Laptop, Palmtop, Client server, N-Tier. Introduction to Networks: LAN, WAN, MAN, etc. Peripherals: Information about Input devices (Keyboard, Mouse, Joystick, Track ball, etc.) - Details about Storage devices (Floppy disk, Hard disk, Tapes (Cartridge, DAT), Compact Disk), Information about Monitors, Printers (impact, non-impact) - Various types of plotters.

UNIT III: SOFTWARE
Software Classification (System, Application, and Utilities). Operating System: Introduction, Basic functions of OS, Classification of OS. Programming Languages: Generation of Languages and their uses. Packages: Spread sheets, DTP Tools, Presentation tools. Application areas of Software - Commercial, Scientific, Real time application etc.

UNIT IV: MULTIMEDIA AND INTERNET
Introduction to multimedia - Hardware, Software and applications - Introduction to Internet, Service providers, Internet naming and addressing - Information about electronic mail, Remote login, File Transfer, Usenet-BBS, HTML. Intranet, Extranet: Introduction to Intranet and Extranet.

UNIT V: OBJECT ORIENTED SYSTEM

TEXT BOOKS

REFERENCE BOOKS
UNIT I: ECONOMIC CONSIDERATIONS
Cost of electrical energy - Expressions for cost of electrical energy – Capital-interest – Depreciation - Different methods - Factors affecting cost of operation - Number and size of generating units - Importance of high load factor - Importance of power factor improvement - Most economical power factor - Meeting the KW demand on power stations - Power system tariffs – Regions and structure of Indian Power System.

UNIT II: ECONOMIC DISPATCH

UNIT III: ECONOMIC OPERATION

UNIT IV: INTERCONNECTED SYSTEMS

UNIT V: OPTIMAL POWER FLOW AND FUNDAMENTALS OF MARKETS

TEXT BOOKS

REFERENCE BOOKS
EE E81 ADVANCED CONTROL ENGINEERING

UNIT I: INTRODUCTION TO CLASSICAL DESIGN

UNIT II: STATE SPACE ANALYSIS
State space formulation – state variable – phase variables and canonical variables – state model from differential equation – state transition matrix – state space representation of discrete time systems

UNIT III: STATE SPACE DESIGN
Eigen values and Eigen vectors – Diagonalization – canonical forms - Controllability and observability - Controller design by state feedback – Necessary and sufficient condition for arbitrary pole placement- state regulator problem. Observer Design – Full order/reduced order observer design

UNIT IV: STABILITY

UNIT V: OPTIMAL CONTROL
Linear quadratic optimal regulator (LQR) problem formulation – optimal regulator design by parameter adjustment (Lyapunov method) – optimal regulator design by Continuous - time Algebraic Riccatti Equation (CARE) – optimal controller design using LQG framework.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: ELECTRO PHYSIOLOGY

UNIT II: BIOMEDICAL MEASUREMENT AND RECORDERs

UNIT III: PULMONARY MEASUREMENT AND BIO TELEMETRY

UNIT IV: MEDICAL IMAGING SYSTEM

UNIT V: THERAPEUTIC UNITS
Physiotherapy and Electrotheraphy - Short wave, Microwave diathermy – Defibrillators – Cardio vector – Hearing aid – dialysis machine.

TEXT BOOKS

REFERENCE BOOKS
EE E83 COMPUTER AND COMMUNICATION NETWORKS

UNIT I: NETWORK MODELS

UNIT II: DATA LINK CONTROL
Types of errors- Error detection and correction- Checksum- Framing- Flow control-Error control- Stop and wait protocol- Go-back N- Selective repeat protocols- HDLC-Random access protocols- Controlled access- Wired LANs- Ethernet- Fast Ethernet- Gigabit Ethernet-IEEE standards, IEEE 802.3, 802.4, 802.5 and 802.6- Wireless LANs- IEEE 802.11 and Bluetooth.

UNIT III: NETWORK ROUTING ALGORITHMS
Logical addressing- IPv4 addresses- IPv6- Internet protocol- Transition from IPv4 to IPv6-Mapping logical to physical address- Mapping physical to logical address- ICMP-Direct Vs indirect delivery- Forwarding- Unicast and Multicast routing protocols- Routers and gateways.

UNIT IV: CONGESTION AND TRAFFIC MANAGEMENT
Queuing analysis- Queuing models- Single server and multi server queues- Congestion control in data networks and internets- Effects of congestion- Congestion and control- Traffic management- Congestion control in packet networks- TCP flow control- TCP congestion control- Requirements for ATM traffic and congestion control- Performance of TCP over ATM.

UNIT V: NETWORK SECURITY

TEXT BOOKS

REFERENCE BOOKS
EE E84 DESIGN AND LAYOUT OF POWER APPARATUS AND SYSTEMS

UNIT I: DESIGN AND LAYOUT OF TRANSMISSION LINES

UNIT II: DESIGN AND LAYOUT OF DISTRIBUTION SYSTEMS

UNIT- III: LAYOUT AND INSTALLATION OF POWER EQUIPMENTS

UNIT IV: LAYOUT AND DESIGN FOR ELECTRIC DRIVES

UNIT- V: DESIGN AND LAYOUT OF SUBSTATIONS
Types of Substations – Indoor and outdoor substations – Selection of Site and Location – Layout diagram of 11 kV / 440 V, 220 / 11 KV substations – Substations requirements, their functions and location – Substation – Switchgear installations – Busbar arrangements and design – Load break switches – Switching substations Location CT’s and PT’s – materials for Busbar – Substations earthing.

TEXT BOOKS

REFERENCES BOOKS
4. Frederick T. Morse, “Power Plant Engineering”, East West Press Private Limited
EE E85 DSP TECHNIQUES FOR SPEECH AND IMAGE PROCESSING

UNIT I: INTRODUCTION DSP CONCEPTS
Introduction – Introduction to discrete time speech signal processing – speech communication path way – Production and analysis of speech – Application.
Review of discrete time signal processing of signals and systems – Discrete – Time Fourier transform – z – transform – properties of LTI system short time fourier transform analysis and synthesis (application to speech signals)

UNIT II: SPEECH PROCESSING

UNIT III: IMAGE PROCESSING
Introduction to Image processing systems – Image sampling and quantization – Basic relationship between pixels – Image enhancement with the spatial domain – Gray level transformation – Histogram processing – Enhancement based on Arithmetic and logic operation – Enhancement based on filter – Enhancement with the frequency domain.

UNIT – IV: NOISE AND FILTERS
Image degradation restoration process – Noise model restoration with the presence of noise only – by spatial domain analysis – Frequency domain analysis – Linear position – invariant degradation – Inverse filtering LMS filtering

UNIT – V: IMAGE COMPRESSION AND SEGMENTATION

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION TO EMBEDDED SYSTEM
Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

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

UNIT II: DEVICES & BUSES FOR DEVICES NETWORK
I/O devices; timer & counting devices; serial communication using I^2C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Serial port & parallel port.

UNIT III: I/O PROGRAMMING SCHEDULE MECHANISM
Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.
Multi threaded programming – Context switching, premature & non-premature multitasking, semaphores.
Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

UNIT I: REAL TIME OPERATING SYSTEM (RTOS)
Introduction to basic concepts of RTOS, Basics of real time & embedded system operating systems, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: COMPENSATORS
Introduction to FACTS controllers – Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

UNIT II: THYRISTOR CONTROLLED SHUNT COMPENSATOR
Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor (TCR) – Thyristor Switched Capacitor (TSC) – Static VAR Compensators (SVC) – SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub-synchronous resonance.

UNIT III: THYRISTOR CONTROLLED SERIES COMPENSATOR (TCSC)

UNIT IV: VSC BASED SHUNT AND SERIES COMPENSATOR
Static Synchronous Series Compensator (SSSC): Principle of operation and characteristics of SSSC – control range and VA rating – capability to provide real power compensation – Immunity to sub-synchronous resonance – control scheme for SSSC.

UNIT V: UNIFIED POWER FLOW CONTROLLER
Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOKS

REFERENCE BOOKS
UNIT I: INTRODUCTION TO HIGH VOLTAGE TRANSMISSION SYSTEMS
Introduction - Historical sketch - Comparison between AC and DC transmission - kinds of DC links – Planning and modern.

UNIT II: HVDC CONVERTERS
Three phase bridge converter - Simplified analysis, waveforms with and without overlap - Current and voltage relations - Input power factor - principles of control – Control characteristics – Constant ignition angle control – Constant current and extinction angle control.

HVDC converters – twelve - higher pulse operation - introduction to modern converters.

UNIT III: HVDC FAULTS AND PROTECTION
Converter faults, commutation failure, axis fire – Disturbance caused by over current and over voltage – Protection against over current and over voltage – Surge arrestors smoothing reactors – Corona effects of DC line – Transient over voltages for DC line – Protection of DC links.

UNIT IV: REACTIVE POWER AND HARMONICS IN HVDC
Sources of reactive power - static VAR system – Reactive power control during transients – Generation of harmonics – Types and design of various AC filters, DC filters – interference-telephone - RI noise.

UNIT V: MULTI TERMINAL HVDC SYSTEMS
Types of MTDC system – Comparison of series and parallel MTDC system – HVDC insulation – DC line insulators – DC breakers – Characteristics and types of DC breakers.

TEXT BOOK

REFERENCE BOOKS
EE E89 POWER SYSTEM RESTRUCTURING AND Deregulation

UNIT I: FUNDAMENTALS AND ARCHITECTURE OF POWER MARKETS

UNIT II: TECHNICAL CHALLENGES
Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study.
Concept of Congestion Management – Bid, Zonal and Node Congestion Principles - Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

UNIT III: TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES

UNIT IV: MARKET PRICING
Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

UNIT V: INDIAN POWER MARKET

TEXT BOOKS

REFERENCE BOOKS
EE E810 SPECIAL ELECTRICAL MACHINES

UNIT I: SINGLE PHASE MACHINES

UNIT II: STEPPER MOTORS
Constructional features; principle of operation; Types of motors – Modes of operation – Drive system and circuit control of Stepper motor – Static and Dynamic Characteristics and Applications.

UNIT III: SWITCHED RELUCTANCE MOTORS
Constructional details - principles of operation - Static and dynamics Torque production – drive circuits – Current regulation – Torque speed characteristics – Speed and torque control – Static observers for rotor position sensing – volt-ampere requirements – Applications.

UNIT IV: PERMANENT MAGNET BRUSH LESS DC MOTORS

UNIT V: PERMANENT MAGNET SYNCHRONOUS MOTORS

TEXT BOOKS

REFERENCE BOOKS