REGULATIONS AND SYLLABUS
(Reg 96)

B.E. Degree Programme (7 Semesters - Part time)

ELECTRICAL AND ELECTRONICS ENGINEERING

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Anna University
Chennai - 600 025.
REGULATIONS
AND
SYLLABUS
(REG 96)

B.E. Degree Programme (7 Semesters - Part time)
ELECTRICAL AND
ELECTRONICS ENGINEERING

ANNA UNIVERSITY
Chennai - 600 025.
DEGREE OF BACHELOR OF ENGINEERING
(Seven Semester Part-Time B.E. Degree Programme)

REGULATIONS 1996

(Applicable for students admitted from January 1996 onwards)

1. CONDITIONS FOR ADMISSION

1.1. QUALIFICATIONS:

Candidates for admission to the first semester, also known as Bridge Semester, of the seven semester part-time B.E. degree programme shall be required to have passed the Diploma Examination in Engineering in the relevant branch of specialisation at the State Board of Technical Education in India, or any equivalent examination already recognised by Anna University.

1.2. ELIGIBILITY:

Candidate seeking admission shall satisfy the following conditions:

a) Eligibility conditions such as class, marks, number of attempts shall be as prescribed by the Syndicate of the University from time to time.

b) Shall have completed 3 years after qualifying for the Diploma, the period being counted as an full January of the year in which admission is sought.

c) Notwithstanding the above the candidate might have passed the various University Entrance Examinations and Proficiency in...
DEGREE OF BACHELOR OF ENGINEERING
(SEVEN SEMESTER PART-TIME B.E. DEGREE PROGRAMME)
REGULATIONS
(Applicable for students admitted from January 1997 onwards)

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known as Bridge semester, of the seven semester part-
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relevant branch of specialization of the State Board of
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1.2. ELIGIBILITY:
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i) Eligibility conditions such as class, marks, number
of attempts shall be as prescribed by the Syndicate
of the University from time to time.

ii) Shall have completed 3 years after qualifying for
the Diploma, the period being counted as on first
January of the year on which admission is sought.

iii) Notwithstanding the qualifying examination the
candidate might have passed (vide clause 1.1), he/she
shall have a minimum level of proficiency in
Mathematics, Physics, Chemistry and the relevant branch of study as may be prescribed by the University.

iv) Shall be employed within a zone of 40km radius from the main campus of the University.

v) Shall satisfy the conditions of physical fitness as prescribed by the Syndicate of the University.

2. DURATION OF PROGRAMME:
The duration of the programme shall be seven consecutive semesters, spread over 3 1/2 academic years, two semesters constituting an academic year. Each semester shall have a minimum of 75 working days.

3. BRANCHES OF STUDY
A candidate may be offered, at the time of admission, one of the following branches of study or such other branches of study as may be instituted from time to time:

Civil Engineering
Mechanical Engineering
Electrical and Electronics Engineering
Electronics and Communication Engineering

The medium of instructions shall be English.

4. COURSES OF STUDY
The courses of study shall include theory and practicals as detailed in the accompanying curriculum.

5. EVALUATION OF CANDIDATES' PERFORMANCE
The evaluation of candidates' performance in each one of the theory courses shall be by continuous assessment comprising three assessments and an end semester examinations as detailed below:

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Duration</th>
<th>% Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment - 1</td>
<td>45 minutes</td>
<td>10</td>
</tr>
<tr>
<td>Assessment - 2</td>
<td>90 minutes</td>
<td>20</td>
</tr>
<tr>
<td>(Mid Semester Exam)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment - 3</td>
<td>45 minutes</td>
<td>10</td>
</tr>
<tr>
<td>End Semester Exam</td>
<td>180 minutes</td>
<td>60</td>
</tr>
</tbody>
</table>

For laboratory courses the continuous assessment marks shall be for 60% and the end semester exam shall be for 40%.

6. DISCIPLINE
i) Every student is required to be disciplined and to have decorous behaviour both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

ii) Any act of indiscipline of a student reported to the Dean of Faculty will be referred to a Discipline and Welfare Committee nominated by the Syndicate from time to time, for taking appropriate action.
7. REQUIREMENTS FOR COMPLETION OF A SEMESTER

A candidate who fulfills the following conditions shall be deemed to have satisfied the requirements for the completion of a semester.

i) He/she secures not less than 70% overall attendance taking into account the total number of periods attended by the candidate in all the courses put together as against the total number of periods in all the courses offered during the semester.

ii) He/she earns a progress certificate from the Head of the Department and the Dean of the Faculty for having satisfactorily completed the programme of study in all the courses pertaining to that semester.

iii) His/her conduct is found to be satisfactory as certified by the Head of the Department and the Dean of the Faculty.

8. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION

i) A candidate shall normally be permitted to appear for the end semester examination of the current semester if he/she has satisfied the semester completion requirements (vide clause 7) and has registered for examination in all the courses of that semester.

ii) In addition, the candidate shall satisfy the following conditions:

a) To be permitted to register for End Semester examination of theory courses of VI Semester, the candidate should have passed in all the courses of I Semester.

b) To be permitted to register for End Semester examination of theory courses of VII Semester, the candidate should have passed in all the courses of I and II Semester.

9. REQUIREMENT FOR PROCEEDING TO A HIGHER SEMESTER

A candidate shall be permitted to proceed from the current semester to the next semester, irrespective of the arrear courses he/she may have in the earlier semester, only if:

i) he/she has satisfied all the semester completion requirements of the current semester.

ii) he/she has registered for the end semester examination in all the courses of the current semester.

iii) However, those candidates prevented in VI Semester from registering for theory courses in the end semester Examination because of not fulfilling
Clause 8ii(a), shall be permitted to go to VII Semester provided they satisfy condition 9(i) and register for end semester examination in practical courses, if any.

10. PASSING REQUIREMENTS AND CLASSIFICATION OF SUCCESSFUL CANDIDATES

i) A candidate shall be declared to have passed the examination in a course of study only if he/she secures not less than 40% marks in the end semester examination and 50% of the total marks (continuous assessment plus end semester examination marks) in that course.

ii) A candidate who has been declared as ‘failed’ in a particular course may reappear for the end semester examination in that course during subsequent semesters when examination in that course is conducted and secure a pass. However, the continuous assessment marks obtained by the candidate in the first attempt shall be retained and considered valid for all subsequent attempts, unless the candidate chooses the option of improving the continuous assessment marks (Vide Clause 13). Further, the semester examination marks obtained in the latest attempt shall alone remain valid.

iii) A candidate who qualifies for the award of the degree (Vide Clause 14) passing the examination in all the courses in all the seven semesters in his/her first appearance within seven consecutive semesters (3 1/2 academic years) and in addition secures an aggregate of not less than 75% of the total marks (continuous assessment plus semester examination marks) for all the courses in the semester II to VII put together shall be declared to have passed the examination in First Class with Distinction. For this purpose, the withdrawal from examination (Vide Clause 11) shall not be construed as an appearance. Further in the case of authorized break of study, the duration of seven consecutive semesters shall be relaxed [Vide Clause 12(ii)].

iv) A candidate who qualifies for the award of the degree (Vide Clause 14), passing the examination in all the courses in the semester II to VII within a period of seven consecutive semesters after his/her commencement of study in the second semester and in addition secures an aggregate of not less than 60% of the total marks (continuous assessment plus semester examination marks) for all the courses in the semesters II to VII put together shall be declared to have passed the examination in First Class. For this purpose the duration of seven
consecutive semesters shall be relaxed Vide Clause 12(iii) in the case of authorized break of study.

v) All other candidate who qualify for the award of the degree (Vide Clause 14) shall be declared to have passed the examination in Second Class.

vi) A candidate who absents in the end semester examination in a course/project work after having registered for the same, shall be considered to have appeared in that examination for the purpose of classification.

11. PROVISION FOR WITHDRAWAL FROM SEMESTER EXAMINATION

i) A candidate may, for valid reasons and on prior application, be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

ii) Such withdrawal shall be permitted only once during the entire course.

iii) Withdrawal application is valid only if it is made earlier than the commencement of the examination in that course or courses and recommended by the Head of the Department and the Dean of Faculty.

iv) Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

v) The candidate shall reappear in the examination only when the examination in that course or courses is conducted.

12. PROVISION FOR BREAK OF STUDY

i) Break of Study shall not normally be permitted. However, if a candidate intends to temporarily discontinue the programme in the middle, for valid reasons, and to rejoin the programme in a later semester, permission may be granted based on the merits of the case provided he/she applies to the University in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Department and the Dean of the Faculty stating the reasons therefor and the probable date of rejoining the course.

ii) The candidate rejoining the programme after the authorized break of study shall be governed by the rules and regulations in force at the time of rejoining.

iii) The duration specified for passing all the courses for the purpose of classification [Vide Clause 10(iii) and (iv)] shall be increased by the period of such authorized break of study.

iv) The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall
not, in any case, exceed the maximum period of 6 years (Vide Clause 14), irrespective of the period of break of study.

v) If any student is either detained in a semester for want of requisite attendance, progress and good conduct, or suspended from the programme by Discipline and Welfare Committee, the resulting period of break of study shall not be considered as an authorized break of study for purpose of classification and Clause 12 (iii) is not applicable in this case.

13. **PROVISION FOR IMPROVING CONTINUOUS ASSESSMENT MARKS**

If a candidate wishes to improve his/her continuous assessment marks in any course or courses, he/she shall apply through the Head of the Department and the Dean of the Faculty for permission to rejoin and repeat that course or courses. Permission may be granted on the merits of the case subject to the following conditions:

i) Such candidate can rejoin the regular semester or semesters when these courses are offered and shall repeat the programme of study in these courses satisfying all requirements (Vide Clause 7).

ii) The maximum period for completion of the programme shall not exceed six years (Vide Clause 14).

iii) He/she shall be eligible to rejoin and repeat all the courses in any one semester or upto a maximum of five courses chosen from utmost two semesters (among I, III, V and VII or II, IV and VI) as far as the regular semester time table accommodates.

iv) He/she shall not be eligible for repeating a course or courses while undergoing a regular semester course of study.

v) The continuous assessment marks and semester examination marks earned during the repeat semester(s) shall alone be valid subsequently.

vi) The candidate will not be eligible for First Class with Distinction or First Class if he/she repeats semester(s) other than the first semester even if he/she is eligible otherwise for the same [Vide Clause 10(iii) and (iv)].

vii) For the purpose of attendance requirement [Vide Clause 7 (i)], the attendance will be considered coursewise for each course, if the candidate does not repeat all the courses in a semester.

14. **ELIGIBILITY FOR THE AWARD OF THE DEGREE**

A candidates shall be declared to be eligible for the award of the B.E. Degree if he/she has

i) undergone the programme for a period of seven semesters,
ii) passed the examination in all the courses prescribed in the respective curriculum within maximum period of six years (12 Semesters) reckoned from the commencement of the first semester to which the candidates was admitted.

iii) no dues to the Institution and

iv) no disciplinary action pending against him/her.

The award of the degree must be approved by the Syndicate.

15. REVISION OF REGULATIONS AND CURRICULUM

The University may from time to time revise, amend or change the regulations, courses of study, syllabi and assessment procedure if found necessary.

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PART TIME

B.E. DEGREE PROGRAMME IN

ELECTRICAL AND ELECTRONICS ENGINEERING

(Curriculum With Effect From January 1997)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Code No.</th>
<th>Course</th>
<th>Periods/Week</th>
<th>Lect.</th>
<th>Lab.</th>
<th>Marks</th>
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**SEMESTER-I (Bridge semester)**

1. PTMA 100  Mathematics I  3  0  100
2. PTPH 100  Physics  3  0  100
3. PTCM 100  Chemistry  3  0  100
4. PTEE 101  Electric Circuit Analysis  3  0  100
5. PTEE 100  Computer Programming  Laboratory  1  2  100

**Total**  13  2  500

**SEMESTER-II THEORY**

1. PTMA 223  Mathematics-II  3  0  100
2. PTEE 102  Basic Energy Engg.  3  0  100
3. PTEE 202  Electromagnetic Theory  3  0  100
4. PTEC 222  Electron Devices  3  0  100
5. PTEE 203  Electrical Machines I  3  0  100

**Total**  15  0  500
<table>
<thead>
<tr>
<th>Sl. No.</th>
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<th>Course</th>
<th>Periods/Week</th>
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<tr>
<td>1</td>
<td>PTMA 001</td>
<td>Numerical Methods</td>
<td>3</td>
<td>100</td>
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<tr>
<td>2</td>
<td>PTEC 223</td>
<td>Electronic Circuits</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>PTEE 204</td>
<td>Electrical Machines II</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>PTEE 205</td>
<td>Signals and Linear Systems</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>PTEE 212</td>
<td>Electric Machines Lab</td>
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<td><strong>Total</strong></td>
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**SEMESTER-IV THEORY**

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<tr>
<td>1</td>
<td>PTEE 307</td>
<td>Control Systems</td>
<td>3</td>
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<tr>
<td>2</td>
<td>PTEE 308</td>
<td>Power Electronics</td>
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<td>3</td>
<td>PTEE 309</td>
<td>Digital Systems</td>
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<td>4</td>
<td>PTEE 310</td>
<td>Transmission and Distribution</td>
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<td>Power Electronics Lab</td>
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<td><strong>500</strong></td>
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**SEMESTER-V THEORY**

<table>
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<th>Sl. No.</th>
<th>Code No.</th>
<th>Course</th>
<th>Periods/Week</th>
<th>Total Marks</th>
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<tbody>
<tr>
<td>1</td>
<td>PTEE 312</td>
<td>Measurements and Instrumentation</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>PTEE 313</td>
<td>Integrated Circuits</td>
<td>3</td>
<td>100</td>
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<tr>
<td>3</td>
<td>PTEE 320</td>
<td>Power System Operation and Control</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>PTEE 316</td>
<td>Microprocessor and Applications</td>
<td>3</td>
<td>100</td>
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<td>5</td>
<td>PTEE 300</td>
<td>Control and Instrumentation Lab</td>
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<td>100</td>
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<tr>
<td></td>
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<td><strong>Total</strong></td>
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<td><strong>500</strong></td>
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**SEMESTER-VI THEORY**

<table>
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<tr>
<th>Sl. No.</th>
<th>Code No.</th>
<th>Course</th>
<th>Periods/Week</th>
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<tbody>
<tr>
<td>1</td>
<td>PTEE 419</td>
<td>High Voltage Engg.</td>
<td>3</td>
<td>100</td>
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<tr>
<td>2</td>
<td>PTEE 311</td>
<td>Design of Electrical Apparatus</td>
<td>3</td>
<td>100</td>
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<tr>
<td>3</td>
<td>PTEE 0</td>
<td>Elective I</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>PTEE 0</td>
<td>Elective II</td>
<td>3</td>
<td>100</td>
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<tr>
<td>5</td>
<td>PTEE 301</td>
<td>Microprocessor Lab</td>
<td>0</td>
<td>100</td>
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<tr>
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<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>500</strong></td>
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List of Elective Course

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<tbody>
<tr>
<td>1</td>
<td>PTED 001</td>
<td>Principles of Robotics</td>
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<tr>
<td>2</td>
<td>PTED 002</td>
<td>Knowledge Based Systems</td>
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<tr>
<td>3</td>
<td>PTED 003</td>
<td>Digital Signal Processing</td>
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<tr>
<td>4</td>
<td>PTED 004</td>
<td>Modern Control Systems</td>
</tr>
<tr>
<td>5</td>
<td>PTED 005</td>
<td>Operations Research</td>
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<tr>
<td>6</td>
<td>PTED 006</td>
<td>EHV AC and DC Transmission</td>
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<td>7</td>
<td>PTED 007</td>
<td>Power System Dynamics</td>
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<tr>
<td>8</td>
<td>PTED 009</td>
<td>Digital Protection</td>
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<td>9</td>
<td>PTED 010</td>
<td>Bio-medical Instrumentation</td>
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<tr>
<td>10</td>
<td>PTED 011</td>
<td>Advanced Power Electronic Systems</td>
</tr>
<tr>
<td>11</td>
<td>PTED 012</td>
<td>Micro-controller Based System Design</td>
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<tr>
<td>12</td>
<td>PTED 013</td>
<td>Special Electrical Machines</td>
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<tr>
<td>13</td>
<td>PTED 014</td>
<td>Energy Engineering</td>
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<tr>
<td>14</td>
<td>PTED 015</td>
<td>Electric Energy Utilisation &amp; Conservation</td>
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<tr>
<td>15</td>
<td>PTED 417</td>
<td>Power System Analysis</td>
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<tr>
<td>16</td>
<td>PTED 418</td>
<td>Solid State Drives</td>
</tr>
<tr>
<td>17</td>
<td>PTCS 207</td>
<td>Object Oriented Programme</td>
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</tbody>
</table>
PTMA 100 MATHEMATICS I

1. MATRICES

Characteristic Equation, Eigenvalues and eigenvectors of a real matrix, Cayley-Hamilton theorem, Reduction of a real symmetric matrix to diagonal.

2. FUNCTIONS OF SEVERAL VARIABLES

Partial differentiation, Total derivative, Taylor expansion, maxima and Minima, Lagrange Multipliers, Jacobian of transformations.

3. DIFFERENTIAL EQUATIONS

Linear equations of second order with constant coefficients, Euler's equation, Simultaneous Equations of first order with constant coefficients.

4. ANALYTIC FUNCTIONS

Cauchy-Riemann equations, properties, Finding harmonic conjugates and analytic functions, conformal mappings of w=z+a,1/z,kz,z²,sinz,cosz, e^z and bilinear transformations.

5. COMPLEX INTEGRATION

REFERENCES:


PTPH 100 PHYSICS

1. PROPERTIES OF MATTER: Elasticity - Stress - strain diagram - factors affecting elasticity - twisting couple on a wire - shafts - Torsion pendulum - Determination of moment of inertia and rigidity modulus - Bending moment - Depression of a cantilever - Young's modulus by cantilever bending - uniform and non-uniform bending - I shape girders


5. NON-DESTRUCTIVE TESTING: radiography methods - X-ray and gamma ray radiography methods (Qualitative treatment only) Ultrasonics - production, properties and applications - Liquid penetrant method - Magnetic method.

REFERENCES:


PTCM 100 - CHEMISTRY

1. WATER

Sources - quality parameters - definition, expression and estimations - domestic water treatment; desalination - reverse osmosis; water quality parameters for industries - treatment - boiler feed water.

2. ENERGY SOURCES

Classification of fuels - Calorific values - Coal, Coke - proximate analysis - refining of petroleum - gasoline - Cracking - thermal and catalytic - Octane number, diesel oil - Cetane number - water gas, produce gas and bio gas - fuel cells.

3. CORROSION AND ITS CONTROL

Corrosion - Chemical and electrochemical - control methods; surface treatments, primers and protective coatings - emulsion paint - special paints - failure of paint coatings.

4. ENGINEERING MATERIALS

Polymers - addition and condensation - thermoplastic and thermosetting plastics - polythene, PVC, teflon, bakelite, nylon and terylene - compounding of plastics - elastomers - vulcanisation of rubber - synthetic rubber - adhesives - types - characteristics - epoxides, urethanes and silicones.

5. POLLUTION AND ITS CONTROL

Causes of pollution - water pollution - domestic, Industrial and agricultural wastes - assessment of pollution - D.O., B.O.D and C.O.D - treatment - primary and secondary (principles only), air pollution - environmental impact - acid rain, green house effect and global warming, ozone depletion and smog - control measures; soil pollution; noise pollution.

TEXT BOOKS:


PTEE 101 ELECTRIC CIRCUIT ANALYSIS

1. BASIC CIRCUIT CONCEPTS:


2. SINUSOIDAL STEADY STATE ANALYSIS:

Phasors - Sinusoidal steady state response- Concepts of impedance and admittance - Analysis of simple circuits- Power and Power factor - Series resonance and parallel resonance- Bandwidth and Q factor.
3. **MESH-CURRENT AND NODE-VOLTAGE METHODS:**

4. **NETWORK THEOREMS AND APPLICATIONS:**

5. **ANALYSIS OF THREE PHASE CIRCUITS:**
   Solution of three phase balanced circuits - Power measurements by two-watt meter methods - Solution of three phase unbalanced circuits.

6. **TRANSIENT ANALYSIS:**
   Forced and free response of RL, RC and RLC circuits with d.c and sinusoidal excitations - Solution by Laplace transform method.

**TEXT BOOK:**


**REFERENCES:**


**PTEE 100 COMPUTER PROGRAMMING**

**LABORATORY**

**UNIX**

Introduction to operating systems - basic commands - vi editor - filters - input/output redirection - piping - transfer of data between devices, shell scripts.

**C PROGRAMMING**

Introduction to C - data types - operators - expression - input/output statements - control statements - loops - function - storage classes - arrays - file handling.

**FORTRAN PROGRAMMING**

Introduction - variables - data types - operators - hierarchy of operations - format statement - control statement - Do loops - arrays - File handling.

**REFERENCES**

1. Stephen G. Kochan and Patrick H. wood, "Exploring the Unix system"
2. Beam, Illustrated C programming

3. V. Rajaraman, Principles of Computer Programming Fortran 77 for IBM PC

4. Seymour Lipschutz, Schaum's outline series - Programming with Fortran

PTMA 223 MATHEMATICS II

1. LAPLACE TRANSFORMS: (9)
   Transforms of simple functions - Basic operational properties
   - Transforms of derivation and integrals - Periodic functions -
   Convolution theorem - inverse transform application to solution
   of second order ordinary differential equations.

2. FOURIER SERIES: (8)
   Dirichlet's conditions - General Fourier series - Half range
   Sine and Cosine series - Parseval's identity - Harmonic
   analysis.

3. PARTIAL DIFFERENTIAL EQUATIONS: (9)
   Formation - Solution of standard types of first order equations
   and Lagrange's Linear equation - Classification of second
   order partial differential equations - Linear partial differential
   equations of second and higher order with coefficients.

4. BOUNDARY VALUE PROBLEMS: (9)
   Transverse vibrations of a string - One dimensional heat
   equation - and two dimensional steady heat flow - Fourier
   series solutions in Cartesian Coordinates.

5. FOURIER TRANSFORMS: (10)
   Fourier integral representation - Fourier transform pairs -
   Properties - Fourier Sine and Cosine Transforms
   - Transforms of simple functions - Transforms of derivatives
   - The convolution integrals of Fourier - Application to one
   dimensional wave diffusion equations.

TEXT:

   G. Advanced Mathematics for Engineering students. Vol II

PTEE 102 BASIC ENERGY ENGINEERING

1. ELECTRICAL ENERGY SOURCES
   Different kinds of energy sources - Hydro, Fossil, Nuclear.
   Non Conventional energy sources - Solar, wind, Tidal - MHD
   - Thermo Nuclear fusion.

2. ENERGY DEMAND
   Forecasting Method - Status of Electrical Energy Production
   in India - Future Prospectus.

3. PRODUCTION OF MECHANICAL ENERGY
   Conversion of Thermal Energy into Mechanical Energy
   - Thermodynamic Power cycles - Internal combustion Engine
   Principles - combustion cycles - Turbines - Steam, Hydro
   and Wind - Electromechanical Energy conversion.
4. PRODUCTION OF ELECTRICAL ENERGY
Conversion of Thermal into Electrical Energy, Mechanical Energy into Electrical Energy - Thermo electric converters - conversion of chemical Energy into Electrical Energy - conversion of Nuclear to Electrical Energy (only qualitative analysis)

5. STORAGE OF ENERGY
Storage of mechanical energy - Kinetic, Potential energy - Storage of electrical energy - Storage of Chemical energy.

6. FOSSIL FUEL SYSTEM
Combustion method of gas, oil and coal - Steam generation boiler, primary and secondary boiler - Choice and rating.

7. ENVIRONMENTAL IMPACT OF POWER PLANT OPERATION
Air, Water pollutions, emission control methods - Solid waste water treatment - Nuclear waste treatment

TEXT BOOKS
1. R.C. Cooper, Principles of Energy Conversion, McGraw hill

PTEE 202 ELECTROMAGNETIC THEORY

1. ELECTROSTATICS:
Charges, Coulomb's Law, Electric field intensity, flux, Gauss's Law, electric potential, Laplace's and Poisson's Equations, electrostatic energy - Dielectrics - Capacitance.

2. MAGNETOSTATICS:
Current density, magnetic fields, magnetic flux, Biot-Savart's Law, Ampere's Law, Force, Torque, vector potential, comparison of static electric and magnetic fields, magnetic circuits.

3. ELECTRODYNAMICS:

4. ELECTROMAGNETIC WAVES:
Generation, plane waves and wave equations - Solutions - Poynting vector - Energy - Propagation through conducting and dielectric media, skin effect, depth of penetration

5. FIELD MODELLING AND COMPUTATION:
Problem formulation, boundary conditions, solutions - Analytical methods - Variable separable method and method of image - Numerical methods - FDM, FEM, CSM

REFERENCE:

PTEC 222 ELECTRON DEVICES

1. ELECTRON DYNAMICS:
Concepts of electronics current in vacuum, gas, liquid and solid - effect of electric and magnetic field on electron and other charged particles - cathode ray tube - Electrostatic and magnetic deflection.

2. SOLID STATE ELECTRONICS:
Review of Energy band structure of Ge, Si, and GaAs-electron, hole generation and recombination; drift and diffusion currents - continuity equation - Hall effect - PN junction - current equation-junction capacitance - breakdown characteristics - Varactor, tunnel, step recovery Schottky and Zener diodes.

3. BIPOLAR JUNCTION TRANSISTOR:
Ebers-Moll equation - input output characteristics - switching characteristics - 'h' parameters - Low frequency and high frequency equivalent circuits - RF transistors - Power transistors.

4. FET, UJT and SCR:
Theory and characteristics of JFET and MOSFET - low frequency and high frequency equivalent circuits - Theory and characteristics of UJT.

5. CCD AND OPTOELECTRONIC DEVICES:
Charge transfer and charge coupled devices-theory and applications. Semiconductor photo electronic devices - LED, LCD, Photo diode, Solar Cell.

TEXT:

REFERENCE:

PTEE 203 ELECTRICAL MACHINES I

1. INTRODUCTION:

2. TRANSFORMERS:

3. ELECTROMECHANICAL ENERGY CONVERSION:
Energy in magnetic systems - Field energy and mechanical force - Singly and multiply excited systems.

4. BASIC CONCEPTS IN ROTATING MACHINES:
MMF of distributed windings - Magnetic fields in rotating Machines - Rotating MMF waves in AC Machines - Generated voltages - Torque in round rotor machines.

5. DC MACHINES:
Construction - EMF and Torque - circuit model - Armature Reaction - Commutation - Methods of excitation -

Characteristics of Generators - Characteristics of Motors - Starting and Speed control - Testing and Efficiency - Parallel Operation.

TEXT:

REFERENCE:

PTMA 001 NUMERICAL METHODS

1. SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

2. INTERPOLATION AND APPROXIMATION:
Interpolation with Newton's divided differences, Lagrange's polynomial, Newton forward and backward differences, Central differences. Least square polynomial approximation.
3. NUMERICAL DIFFERENTIATION AND INTEGRATION: 9

Numerical differentiation with interpolation polynomials. Numerical integration. by trapezoidal rule, simpson's rule, Romberg's rule. Two point Gauss formula and three point Gauss formula. Double integrals using trapezoidal and Simpson's rule.

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS: 8

Taylor series, Euler, Modified Euler, Runge-Kutta method of fourth order for first and second order differential equations, Predictor and corrector methods of Milne and Adams-Bashforth.

5. BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS: 10

Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation and wave equation and two dimensional Laplace and Poisson equations.

Total = 45

REFERENCES:


PTEC 223 ELECTRONIC CIRCUITS

1. AMPLIFIERS:

Biasing circuits for transistors, FET and their analysis- CE, CC and CB amplifiers- FET amplifiers-frequency response- cascade and Darlington connections- Analysis of class A and B power amplifiers- complementary symmetry amplifiers.

2. DIFFERENTIAL AND TUNED AMPLIFIERS:

Differential amplifiers- common mode and difference mode analysis- Drift compensation- FET input stages- chopper stabilizer amplifier- Introduction to tuned amplifiers.

3. FEEDBACK AMPLIFIERS AND OSCILLATORS:

Advantages of negative feedback- voltage/current, series/shunt feedback- positive feedback- condition for oscillations; phase shift- Wien bridge, Hartley, Colpits and crystal oscillators.
4. PULSE CIRCUITS:
RC wave shaping circuits- Diode clamps and clippers-
Multivibrators- Schmitt triggers- UJT and transistor sawtooth
oscillators.

5. RECTIFIERS AND POWER SUPPLIES:
Single phase rectifiers and analysis of filter circuits- Design
of zener and series voltage regulators- switched mode power
supplies.

TEXT:

REFERENCE:
1. Millman and Halkias, Integrated Electronics, McGraw Hill,
Int. Student Edition 1990
2. Millman and Taub, Pulse, Digital and Switching Wave forms,

PTEE 204 ELECTRICAL MACHINES - II
1. SYNCHRONOUS MACHINES:
Construction - Types - Circuit model - Synchronous
reactance - Voltage regulation - EMF, MMF, POTIER and
ASA methods - Armature reaction - Synchronising - Parallel
operation - Operating characteristics - capability curves -
Salient Plot Synchronous machines - Hunting - Short circuit
transients.

2. THREE PHASE INDUCTION MACHINES:
Construction - Types - Principle of operation - Equivalent
circuit - Torque and Power output - Testing - circle diagram -
Starting - Cogging and Crawling - Starting and Speed
Control - Double cage rotor - induction generator -
Synchronous Induction motor.

3. FRACTIONAL HORSEPOWER MOTORS:
Single phase induction motor - double revolving field theory -
Equivalent circuit - Performance analysis - load
characteristics - starting methods - shaded pole induction
motor - Variable Reluctance motor - Stepping
motor-Hysteresis motor- AC series motor - Repulsion motor
- Linear motor - Permanent magnet dc and ac motors.

TEXT:
1. Nagrath,I.J. and Kothari,D.P., Electric Machines, T.M.H.
Publishing Co. Ltd., New Delhi, 1990

REFERENCE:
1. Fitzgerald, A.E.,Charles Kingsley Jr, Stephen D.Umans,
PTEE 205 SIGNALS AND LINEAR SYSTEMS

1. REPRESENTATION OF SIGNALS:
   General methods of representation - Classification of signals - Representation in terms of elementary signals - Singularity functions - Impulse function.

2. REPRESENTATION OF SYSTEMS:
   Differential equations of translational and rotational systems - Difference equations of linear discrete systems - Transfer function Block diagram representation - Block diagram algebra - Signal flow graph - Mason’s gain formula - Concepts of state, state variables and state model - State models using physical and phase variables - Solution of state equations.

3. ANALYSIS OF SYSTEMS BY METHOD OF LAPLACE TRANSFORM:
   Review of Laplace Transform - Laplace transform of important functions and operations - Response of systems to periodic and nonperiodic excitations - Convolution integral - Superposition integral.

4. FOURIER TRANSFORM AND APPLICATIONS TO SYSTEM ANALYSIS:
   Continuous time Fourier transform of periodic and aperiodic signals - Properties of continuous time Fourier transform - Frequency response of linear time-invariant continuous time systems - Discrete time Fourier series - Discrete time Fourier transform - Frequency response of LTI discrete time systems.

5. Z TRANSFORM AND APPLICATIONS TO LINEAR DISCRETE SYSTEMS:
   Linear discrete systems - Pulse transfer function - Response of Linear discrete systems by Z-Transform method - Z and s domain relationship - Stability determination using mathematical tests - Discrete convolution.

TEXT:

REFERENCE:
2. Cooper, G.R and McGillem, C.D., Methods of Signal and System Analysis Holt, Richart and Winston Inc.USA

PTEE 200 ELECTRIC MACHINES LAB
1. Regulation of 3 phase alternator by ZPF and ASA method.
2. Slip Test.
5. Separation of losses in three phase Induction motor.
7. Separation of no load losses in a single phase transformer.
8. Sumpner's test.
10. SCOTT connection.

PTEE 307 CONTROL SYSTEMS

1. INTRODUCTION TO CONTROL SYSTEMS:

Open and closed loop control - Servomechanisms - Sampled data and digital control systems - Multivariable control systems - Applications of control in non-engineering fields - Effects of feedback on parameter variations - System dynamics and disturbance signal - Electrical control components and systems - Stepper motor - Hydraulic and pneumatic system - Gyroscopes.

2. TIME RESPONSE:


3. FREQUENCY RESPONSE:

Correlation between time and frequency response for second order systems - Bode plots - Gain margin and Phase margin - Effect of gain adjustment - All pass and non-minimum phase systems - Experimental determination of transfer function - constant M and constant N circles - Nichols chart.

4. STABILITY:


5. CLASSICAL DESIGN:

Consideration of classical design; Realization of basic compensators - Cascade compensation in time domain - Cascade compensation in frequency domain - Feedback compensation.

TEXT:


REFERENCE:

**PTEE 308 POWER ELECTRONICS**

1. **POWER SEMI-CONDUCTOR DEVICES:**
   
   Power diode, power transistor, SCR, TRIAC, GTO and MOSFET. Driver circuits, Turn-on methods - commutation and various commutation circuits.

2. **PHASE CONTROLLED CONVERTERS:**
   
   2 pulse, 3 pulse and 6 pulse converters - Inverter operation - comparision of symmetric and asymmetric semiconverters - effect of source inductance and firing circuits.

3. **DC TO DC CHOPPERS:**
   
   Voltage, current and load commutated choppers. Step up chopper and firing circuits.

4. **INVERTERS:**
   
   Series inverter - Parallel inverter - Mc-Murray inverter - Mc-Murray-Bedford inverter, current source inverter, voltage control and waveform control.

5. **AC CHOPPERS AND CYCLOCONVERTERS:**
   
   Single phase ac chopper, multi stage sequence control. Step up and step down cycloconverters. Three phase to single phase and three phase to three phase cyclo-converters.

**REFERENCE:**


**PTEE 309 DIGITAL SYSTEMS**

1. **NUMBER SYSTEM AND CODES:**
   
   Efficiency of a number system - Radix conversion - Arithmetic with base other than ten - Alphanumeric codes - various codes - error detection and correction.

2. **BOOLEAN ALGEBRA AND COMBINATIONAL LOGIC DESIGN**
   
3. LOGIC FAMILIES AND DIGITAL ICs:

RTL, DTL, TTL, ECL, and MOS families and their characteristics - Internal circuits of basic gates AND, OR, NOT and XOR using Bipolar, MOS and CMOS families - Multiplexer and Demultiplexer - Encoder and Decoder - Half adder and Full adder - Subtractor and Magnitude comparators.

4. SEQUENTIAL LOGIC CIRCUITS:


5. DESIGN OF DIGITAL SYSTEMS:

Examples for combinational logic circuit design - Sequential logic circuit design - State minimization - Design of counters using Flip-Flops - System Design using multiplexer and Demultiplexer - Encoder - Decoder - Memory based design - Design using PAL and PLA.

TEXT:


REFERENCE:


PTEE 310 TRANSMISSION AND DISTRIBUTION

1. INTRODUCTION:

Structure of Electric Power System - One line diagram - Generation - Transmission - Sub-transmission and Distribution systems - Recent trends in Power Transmission - EHV AC and HVDC transmission and their advantages - Classification of substations - Electrical layout and Busbar arrangement in generating substations and bulk power substations.

2. TRANSMISSION LINE PARAMETERS:

Resistance, Inductance and Capacitance of single and three phase (including double circuits) transmission lines - Stranded and Bundled conductors, symmetrical and unsymmetrical spacing, transposition - Application of Self and Mutual GMD - Skin and proximity effect - Inductive Interference with neighbouring circuits.

3. CHARACTERISTICS AND PERFORMANCE OF TRANSMISSION LINES:

Equivalent circuits for short, medium and long lines - Attenuation constant, phase constant, surge impedance and surge impedance loading - Transmission efficiency and regulation - Real and reactive power flow in lines, P-delta and Q-V relations - Power angle diagram - Limiting factors of Transmission line load ability - Shunt and series compensation - Ferranti effect and corona loss.
4. INSULATORS AND CABLES:

Insulators - Types of Insulators for O.H. lines, Voltage distribution in insulator string and grading, string efficiency-
U.G. Cables - Constructional features of L.T. and H.T. cables- capacitance, Dielectric stress and Grading -
Dielectric loss - Thermal characteristics - capacitance of three core cables

5. A.C. DISTRIBUTION SYSTEM:

Distribution system substations - Primary and secondary distribution network structure- Voltage regulation- Design of rural distribution- planning and design of town electrification schemes- power factor improvement apparatus- Energy losses in distribution system.

TEXT:


REFERENCE:


PTEE 201 POWER ELECTRONICS LAB

1. SCR Characteristics.
2. UJT Relaxation oscillator circuits.
3. SCR trigger circuits.
4. Forced commutation circuits.
5. Voltage and current commutation.
6. SCR phase control circuits.
7. Triac phase control circuits.
8. SCR converters.
9. SCR regulated power supply.
10. Speed control of DC shunt motor.
11. SCR DC circuit breaker.
12. Zero voltage switching

PTEE 312 MEASUREMENTS AND INSTRUMENTATION

1. GENERAL CHARACTERISTICS OF MEASURING INSTRUMENTS:

2. SENSORS FOR TRANSDUCERS:

3. SIGNAL CONDITIONING:

4. ELECTRICAL MEASURING INSTRUMENTS:

5. INPUT-OUTPUT DEVICES AND DISPLAYS:
Magnetic tape recorders, Data plotters, Floppy discs. CRT displays and digital CRO, LED, LCD and alpha-numeric displays. Display multiplexing.

TEXT:
3. VOLTAGE REGULATORS AND MULTIPLIERS:
Series OP amp regulator - IC voltage regulators - 723 general purpose regulator - Switching regulator - Multiplying DC voltages - Frequency doubling - Phase angle detection - AM Modulation/demodulation - SSB modulation/demodulation - Frequency shifting.

4. ACTIVE FILTERS AND TIMERS:

5. DETECTORS:

TEXT:
1. Roy Choudhury and Shail Jain, Linear Integrated Circuits.

REFERENCE:

PTEE 320 POWER SYSTEM
OPERATION AND CONTROL

1. INTRODUCTION
Approach adopted in utilities for providing reliable, quality and economic electric power supply; Necessity for regulation of system frequency and voltage; p-f and Q-v control structure; recent trends in real time control of power systems.

Load Dispatching: System Load Characteristics load curves, chronogical load curves, load duration curves, energy time curves, load factor, demand factor, Reserve requirements, installed reserve; spinning reserve, cold reserve, Hot reserve; operational restrictions; Load Dispatching.

2. PRE-REQUISITES OF LOAD DISPATCHING
Load Forecasting; Components of system load, classification of base load, forecasting of base load by method of least square fit, introduction to unit commitment constraints on unit commitment, unit commitment using priority ordering.

3. POWER FREQUENCY CONTROL
Local 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.

System Control: 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 responses tie line
with frequency bias control of two area.

4. ECONOMIC DISPATCH CONTROL
Incremental cost curve, co-ordination equations with loss
neglected - solution by iteration, co-ordination equations with
loss included (no derivation of Bmn coefficients); Solution of
coordination equations using Bmn coefficients by iteration
method. Base point and participation factors; Economic
Dispatch controller added to LFC.

5. REACTIVE POWER VOLTAGE CONTROL
Local control: Fundamental characteristics of excitation
systems; block diagram of excitation system control;
Generation and absorption of reactive power, method of
voltage control, injection of reactive power, static shunt
capacitor/inductor VAR compensator, tap changing
transformer.

TEXT BOOK
1. O.LLE I.Elegard, Electric Energy System Theory An
Delhi, 1983.

REFERENCES:
1. Allen J.Wood, Bruce F.Wollenbarg, Power Generation

Power System Analysis and Control, Tata McGar-Hill

PTEE 316 MICROPROCESSORS AND
APPLICATIONS

1. INTRODUCTION
Evolution of Microprocessor - Microcomputer hardware
programming concepts - Instruction Format - Addressing
modes - Microprocessor development system - Practical
Applications.

2. 8085 PROCESSOR:
Architecture - instruction format - addressing modes - Basic
timing diagram - input/output - interrupt system - 8085 based
hardware and software design.

3. 8086 PROCESSOR:
Architecture - addressing modes - instruction format and
instruction set - Basic Bus Cycle - interfacing memory
-programmed I/O - interrupt system - 8086 based simple
system design.

4. MC 68000 PROCESSOR:
Programming model - instruction format and addressing
modes - Pins and signals - Timing diagram - memory and I/O
interfacing - Interrupt - simple programming.
5. PERIPHERAL INTERFACING:

8255 PPI - 8251 USART - 8279 keyboard display controller
- DMA controller 8237 - programmable interrupt controller
8259 - programmable Timer 8254 - interfacing with 8 bit and
16 bit processors.

TEXT:

1. Mohammed Rafiuzzaman, Microprocessors and Microcomputer based system design, Universal Book Stall New Delhi, 1990.

REFERENCE:


PTEE 300 CONTROL AND INSTRUMENTATION LAB

1. Transfer function of separately excited DC Generator.
2. Transfer function of Armature controlled DC Motor.
3. Transfer function of Field controlled DC Motor.
4. Compensating Networks
5. Study of Synchros
6. Study of transducers
7. Digital control (P and PI) of first order plant
8. DC Stepper Motor
9. DC Position Control system
10. AC Position Control system
11. PTE 419 HIGH VOLTAGE ENGINEERING

1. OVER VOLTAGES AND INSULATION COORDINATION:

Causes and types of over voltages - Lightning, switching, temporary over voltages - Effects of over voltages on power systems and components - EMI and EMC protection against over voltages - Surge diverters - Insulation coordination.

2. GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS:

Generation of high AC, DC, impulse and switching voltages - Generation of high impulse currents.

3. MEASUREMENT OF HIGH VOLTAGE AND HIGH CURRENTS:

Measurement of high AC, DC, impulse and switching voltages using sphere gaps, peak voltmeters, potential dividers, high speed CRO and digital techniques - Measurement of high currents.
4. DIELECTRIC BREAKDOWN:

Self and non-self restoring insulation - Breakdown in gases, solids and liquids - Breakdown in uniform and non-uniform fields - partial discharges - Corona and RIV.

5. HIGH VOLTAGE TESTING:

Standards and specifications - Types of tests - Testing and fault diagnostics - Testing of circuit breakers, isolators and air switches - Testing of insulators, bushings and surge diverters.

6. PRACTICALS:

1. Study of AC, DC and impulse voltage generators

2. Measurement of AC (peak) voltages using sphere gap arrangements

3. Measurement of voltage distribution across the string of insulators

4. Measurement of capacitance and tan δ of solid and liquid dielectrics

5. Determination of dielectric strength of dielectric materials

6. Measurement of harmonics in transformers

7. Impulse voltage distribution across the transformer

8. Step response characteristics of shunts and potential dividers

9. Study of DC and AC arcs

10. Study of VXI instrumentation for high voltage measurements

11. Study of partial discharges

12. Computer simulation of Impulse generator using SPICE

REFERENCES:


PTEE 311 DESIGN OF ELECTRICAL APPARATUS

1. INTRODUCTION:
   Basic concept of design - Standard specifications -
   Classification of materials - Electric and magnetic circuits -
   Leakage reactance calculation - Thermal rating of electrical
   apparatus - Performance prediction from thermal rating.

2. DC MACHINES:
   DC Machines - Constructional details - Output equation -
   Main dimensions - Choice of number of poles - Armature
   and field coil design - Design of commutator and brushes -
   Performance calculation.

3. TRANSFORMERS:
   Constructional details - Output rating - Output equation -
   Design of core windings - Single and three phase
   transformers - Determination of no-load current and
   equivalent circuit parameters - Design of tank and cooling
   tubes for distribution transformers - Performance
   calculations.

4. INDUCTION MOTORS:
   Constructional details - Output equation - Main dimensions
   - Design of stator - Design of squirrel cage and slip ring
   rotor - Determination of no-load current and equivalent circuit
   parameters - Performance prediction using circle diagram.

5. COMPUTER AIDED DESIGN:
   Computers in design, Flow chart, Magnetic field calculations
   using finite difference and finite element methods.
   Determination of equipotential lines.

TEXT:
1. Sawhney, A.K. A Course in Electrical Machine Design ,
2. Sen, S.K., Principles of Electrical Machine Designs with

PTEE 301 MICROPROCESSOR LAB

1. Familiarization of 8 bit processor trainer kits.
2. Familiarization of 16 bit processor trainer kits.
3. Programming exercises involving looping, loop with counting
   indexing.
4. Multiplication and Division of signed and unsigned numbers.
5. Look-up Tables and Code Conversion.
6. Interfacing LED, Switching using 8255 PPI and drives.
7. Interfacing of DIP switch and Thumb wheel switches.
8. Interfacing of 8 bit D/A and A/D Converters.
10. Design and implementation of temperature control loop.
11. Study of serial interface and interfacing of VDU.

12. Interfacing of Matrix key board and seven segment LEDs using 8279 controller.

PTMG 421 PRINCIPLES
OF MANAGEMENT

1. INTRODUCTION AND OVERVIEW:

2. FUNCTIONS OF MANAGEMENT:
Organizing - Nature and Purpose - Organizational structure - Delegations - Decentralization - Span of control - Departmentation.

3. STAFFING-SELECTION-RECRUITMENT PROCESS:

4. FUNCTIONAL MANAGEMENT:
Financial management - Short term and long term - Sources of funds - Financing decision - Investment decision - Introduction to financial statements. Production Management - Planning and Scheduling, Purchasing, Inventory control.

5. MARKETING MANAGEMENT:
Introduction to management - Mix - Product, Pricing, Promotion and Place - Personnel Management - Performance appraisal, conflict - Identification and resolution - Training and development. Introduction to Total Quality Management, Quality circles.

TEXT:

PTEE 314 PROTECTION AND SWITCHGEAR

1. INTRODUCTION:
Basic terminology - essential qualities of protective relays - R - X diagram.

2. RELAY CHARACTERISTICS:
Over Current relays - Directional O.C. relays - Distance relays - Differential relays Under Frequency relays - Negative sequence relays - Solid State relays - Comparators.
3. APPARATUS PROTECTION:


4. THEORY OF ARC QUENCHING:

Arcing phenomena and arc quenching - RRRV - current chopping and capacitive current breaking - D.C. circuit breaking.

5. CIRCUIT BREAKERS:


TEXT:


REFERENCE:


PTEE 001 PRINCIPLES OF ROBOTICS

1. TYPES AND BASIC COMPONENTS OF ROBOTS:

Automation and Robotics - Robot anatomy - Classification of Robots by DOF motion, platform, power source, intelligence and application area - Manipulators, wrists, End effectors, Control units, Power units - Robot sensors, Proximity sensors, Range sensors, Tactile sensors, Visual sensors, sensors for mobile robots.

2. ROBOT MOTION ANALYSIS AND CONTROL:

Introduction to manipulator Kinematics - Homogeneous transformation and Robot kinematics - manipulator path control - robot dynamics - configuration of a Robot controller - obstacle avoidance.

3. ARTIFICIAL INTELLIGENCE:

AI techniques - LISP Programming - AI and Robotics - LISP in the factory - sensing and digitizing function in machine vision - Image processing and analysis - Training and vision system - Neural language processing - speech recognition - Legged locomotion - collision avoidance - Natural networks computing.

4. ROBOT PROGRAMMING AND APPLICATIONS:

Methods of Robot programming - Lead through programming methods - A robot program as a path in space - motion interpolation - weight, signal and delay commands - Branching, capabilities and limitations of lead through
methods - Applications of Robots in Material handling, processing operations and Assembly and inspection - future applications of Robots.

TEXT:


REFERENCE:


PTEE 002 KNOWLEDGE BASED SYSTEM

1. INTRODUCTION:
Definition - architecture - difference between conventional and expert system programs.

2. KNOWLEDGE REPRESENTATION AND FORMAL LOGIC:
Knowledge components - levels of representation - knowledge representation schemes - formal logic - knowledge engineering and inference process - Semantic networks - frames - scripts - production systems.

3. KNOWLEDGE ACQUISITION:
Knowledge engineer - knowledge acquisition techniques - concept formalisation - knowledge representation development - knowledge acquisition for core problems - knowledge acquisition without knowledge engineers.

4. PROBLEM SOLVING STRATEGIES:
Exhaustive search - Large search spaces - planning - least commitment - principle and constraint propagation - classification and black board models.

5. EXPERT SYSTEM TOOLS:
Languages for Expert system development - Expert system shells - lisp machines - PC - based Expert system tools.

6. EXPERT SYSTEM DEVELOPMENT PROCESS AND APPLICATIONS:
Expert system and software engineering - problem selection - proto type construction, formalisation, implementation and evaluation. Diagnostic and control applications in high voltage - power systems - control problems.

TEXT:


REFERENCE:


**PTEE 003 DIGITAL SIGNAL PROCESSING**

1. **FUNDAMENTALS OF DISCRETE-TIME SIGNALS:**
   Important discrete - Time signals. Discrete - Time systems - Fourier transform sequences - Sampling of continuous time signals - Digital filter with A/D and D/A - Z transform and Inverse Z transform - Relation ships between system representation - computation of frequency response.

2. **ANALOG FILTER DESIGN:**

3. **DIGITAL FILTER DESIGN:**

4. **REALIZATION OF DIGITAL FILTERS:**
   Direct, cascade and parallel realization of IIR filters - State Variable realizations - Realizations of FIR filters - Implementation of digital filters.

5. **DISCRETE FOURIER TRANSFORM:**

   Continuous and discrete-time Fourier series - Discrete Fourier transform - Fast Fourier transform - Interpretation of DFT results - DFT of sinusoidal sequences.

**TEXT:**


**REFERENCE:**


**PTEE 004 MODERN CONTROL SYSTEMS**

1. **STATE VARIABLE ANALYSIS AND DESIGN:**
   State models - Solution of state equations - Controllability and observability - Pole assignment by state feed back - Full and reduced order observers.

2. **NONLINEAR SYSTEMS:**
   Common types of nonlinear phenomena - Linearization - singular points - Phase plane method - Construction of phase trajectories - System analysis by phase plane method - Describing function method - Describing functions of
nonlinear elements - Stability analysis by describing function
method - Jump resonance - Liapunov’s and Popov’s stability
criteria.

3. OPTIMAL CONTROL:

Problem formulation - Necessary conditions of optimality
- State regulator problem - Matrix riccati equation - Infinite
time regulator problem - output regulator and tracking
problems - Pontryagin’s minimum principle - Time optimal
control problem.

4. ADAPTIVE CONTROL:

Classification - MRAC systems - Different configuration,
classification, mathematical descriptions - Direct and indirect
MRAC - Self tuning regulators - Different approach to self
tuning, recursive parameter estimation, implicit and explicit
STR.

5. DIGITAL CONTROL SYSTEM:

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

REFERENCE:

1. Nagrath, I.J. and Gopal, M., Control System Engineering,

3. Chalam V.V., Adaptive Control Systems, Marcel Dekker,
4. Gopal, M., Modern Control System Theory, Wiley Eastern
5. Stanley M. Shiners, Modern Control System Theory and
Design, John-Wiley and Sons, Singapore, 1992

PTEE 005 OPERATIONS RESEARCH

1. LINEAR PROGRAMMING-I:

Formulation of LP models, Linear program in standard form-
Simplex method.

2. LINEAR PROGRAMMING-II:

Revised simplex method- Duality theory- Dual simplex
method- Sensitivity analysis- Parametric programming.

3. INTEGER AND MIXED INTEGER PROGRAMMING:

Formulation of integer programming problems- Solution of
pure integer and mixed integer problem, Integer
programming problems using Branch and Bound method and
zero-one programming.

4. DYNAMIC PROGRAMMING:

Mathematical description- Optimal decision policy- Solution
using recursive equation approach- Computational
procedure.
5. NON-LINEAR PROGRAMMING TECHNIQUES:

Unconstrained optimization - Quadratic interpolation method - Constrained optimization with equality constraints - Lagrange multipliers - Constrained optimization with inequality constraints - Kuhn-Tucker conditions - Solution by gradient projection method and penalty function method.

TEXT:


REFERENCE:


PTEE 006 EHV AC AND DC TRANSMISSION

1. TRANSMISSION ENGINEERING:

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

2. LINE PARAMETERS:

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

3. POWER CONTROL:

Power frequency and voltage control - Over voltages - Power circle diagram - Voltage control using shunt and series compensation - Static VAR compensation - Higher Phase Order System - FACTS.

4. EHV AC TRANSMISSION:

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

5. HVDC TRANSMISSION:

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

TEXT:


REFERENCE:


PTEE 007 POWER SYSTEM DYNAMICS

1. INTRODUCTION:
Power system stability problem - Basic concepts - Classification of stability problems.

2. SYNCHRONOUS MACHINE MODELLING:

3. SIMPLIFIED MODELS AND MACHINE CONTROLLERS:
d-axis and q-axis Reactances and Time Constants - Simplified machine models - Load models - Block diagram for excitation system - Turbine and speed governor systems, and their state equations.

4. SMALL-SIGNAL STABILITY:
Small-signal stability of a single-machine connected to infinite bus system - Effects of excitation system - Power system stabilizer - Small signal stability of multi-machine systems.

5. TRANSIENT STABILITY:
Runga-Kutta Numerical Integration methods and methods - Representation of synchronous machine (d-q model) - Excitation system, Turbine, governor systems and loads - Overall system equations and their solution for the determination of transient performance.

REFERENCES:

PTEE 009 DIGITAL PROTECTION

1. INTRODUCTION:
Review of Logic gates - Microprocessor fundamentals - Microcontrollers - Digital signal processors - Static relays - Comparators.

2. DIGITAL PROTECTION FUNDAMENTALS:
Sampling - Signal conditioning - A/D conversion - D/A conversion - Amplification and trip circuit.

3. APPARATUS PROTECTION:
Digital Protection of Synchronous Generators - Type of faults - Protection Schemes - Digital Protection.

4. DIGITAL PROTECTION OF TRANSFORMERS:
Types of faults - Schemes of Protection - Digital Protection.

5. DIGITAL PROTECTION OF TRANSMISSION LINES:
Distance relays - Travelling wave relays - Amplitude, directional and phase comparison relay - Fault location schemes - Filtering schemes - Hard-ware and software designs.
TEXT:


REFERENCE:


PTTEE 010 BIO-MEDICAL INSTRUMENTATION

1. INTRODUCTION:

Cell structure- electrode - electrolyte interface, electrode potential, Resting and Action potential- electrodes for their measurement.

ECG, EEG, EMG - Machine description - method of measurement - there equipment failures and troubleshooting.

2. TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATIONS:

Transducers of resistive, inductive, capacitive, Fiber, optical photoelectric, piezo electric and chemical transducer types - their description and feature applicable for medical instrumentation.

3. AMPLIFIERS USED IN INSTRUMENTS:

Input isolation, DC amplifier, power amplifier, differential amplifier- feedback, op Amp- electometer amplifier, carrier Amplifier- instrument power supply.

4. RECORDERS AND DISPLAY DEVICE:

Oscillagraghic- galvanometric- X-Y; magnetic recorder, storage oscilloscopes- electron microscope- PMMC writing systems.

5. CARDIAC MEASUREMENTS:


TEXT:


REFERENCE:

PTEE 011 ADVANCED POWER
ELECTRONIC SYSTEMS

1. REACTIVE POWER COMPENSATION:
TSC and TCR systems- theory of load compensation - power factor improvement using forced commutation methods- saturable core reactors-control strategies.

2. CONTROL USING STATIC TAP CHANGERS:
Conventional and static tap changing methods, control schemes and comparison.

3. EXCITATION CONTROL:
Solid state excitation of synchronous generators - static, brushless excitation systems and governor excitation system and control strategies.

4. UPS SYSTEMS:
Quasi-resonant converters, resonant inverters, parallel, redundant and non-redundant UPS- UPS using resonant power converters, switched mode power supplies.

5. OTHER APPLICATIONS:
HVDC system, FACTS, induction heater control using phase control and resonant inverters.

TEXT:

REFERENCE:
1. Ilango, B., Lecture notes on Power Electronics, Anna University, Madras.

PTEE 012 MICRO-CONTROLLER
BASED SYSTEM DESIGN

1. THE ROLE OF MICRO-CONTROLLERS:
Application examples, comparison with micro-processors.

2. MICRO-CONTROLLER RESOURCES:
Family members, bus widths, program and data memory, parallel ports, D/A and A/D converters, reset circuitry, watchdog timers, power-down considerations.

3. REAL-TIME CONTROL:
Interrupt Structures, programmable timers, real-time clock, latency, interrupt density and interval constraints.

4. PROGRAMMING FRAMEWORK:
CPU register structure, addressing modes, instruction sets, assembly languages, assemblers.

5. SOFTWARE BUILDING BLOCKS:
Queues, tables and strings, program organization. Micro-controler expansion methods, I/O hardware alternatives, development tools, Intel 8096 details.
4. PERMANENT MAGNET BRUSHLESS D.C. MOTORS:
Principle of operation - types - magnetic circuit analysis - EMF and Torque equations - Power Controllers - Motor characteristics and control.

5. PERMANENT MAGNET SYNCHRONOUS MOTORS:
Principle of Operation - EMF and torque equations - reactance - Phasor diagram - Power Controllers - Converter volt-ampere requirements - torque speed characteristics - Microprocessor based control.

TEXT:


REFERENCE:

PTEE 014 ENERGY ENGINEERING

1. CONVENTIONAL ENERGY SOURCES:
   Energy sources - Coal, Oil, natural gas, nuclear fuels, hydro power, nature, formation, resources, energy situation, National and International.

2. NEW AND RENEWABLE ENERGY SOURCES:
   Design and operation of power plants and other systems using new and renewable energy sources, solar, wind, geothermal, ocean, thermal, tidal wave, Bio-gas plants, Bio-mass energy, Wood gas, Alternate fuels for automotive engines

3. DIRECT AND NEW ENERGY CONVERSION:
   Solar Cells, Fuel Cells, Magneto hydro dynamic generator, prospects of large, medium and small scale power generation, New energy transformations, coal gasification, synthetic fuels, Hydrogen

4. CO-GENERATION AND FLUIDIZED BED COMBUSTION:
   Topping and bottoming cycles, cogeneration in process industries, power plants.

5. ENERGY CONSERVATION AND MANAGEMENT:

TEXT:


REFERENCE:


PTEE 015 ELECTRIC ENERGY

UTILIZATION AND CONSERVATION

1. ELECTRIC HEATING:
   Resistance heating - Induction heating - Dielectric heating - Arc furnace - Energy conservation in Arc furnace industry
   Welding-Electro-chemical processes.

2. ELECTRIC LIGHTING:

3. ELECTRIC VEHICLE:
   Railway electrification - Definition and analysis of traction effort - Speed - Time curve - Traction motors - Battery driven
PTEE 417 POWER SYSTEM ANALYSIS

1. INTRODUCTION:

Need for System Analysis in planning and operation of power system - Distinction between steady state and transient state - Symmetrical three phase system and per phase analysis - Modelling of generator and load for power flow, short-circuit and stability analysis per unit quantities.

2. NETWORK MODELLING:

Primitive network and its matrices - Bus incidence matrix - Bus admittance and impedance matrix formation - PI-Equivalent circuit of Transformer with Off-Nominal tap ratio.

3. SHORT CIRCUIT ANALYSIS:

Short circuit capacity - Symmetrical short circuit analysis - Symmetrical component transformation - Sequence impedance - Z-Bus in phase frame and in sequence frame - Fault matrices - Unsymmetrical fault analysis.

4. POWER FLOW ANALYSIS:


5. TRANSIENT STABILITY ANALYSIS:

Transient and dynamic stability - Swing equation in state space form - Stability analysis of single machine connected
to infinite bus by modified Euler's method, using classical
machine model - Equal area criterion - Critical clearing angle
and time - Multi- machine stability analysis using classical
machine model and constant admittance load representation
using modified Euler's method.

TEXT:


REFERENCE:


PTEE 418 SOLID STATE DRIVES

1. DRIVE CHARACTERISTICS:

   Characteristics of Mechanical system. Selection of drive.

2. DC DRIVES:

   Single phase and Three phase converter fed drives - continuous and discontinuous conduction modes- SCR based Class B, Class C and Class C commutation- Chopper fed drives and Breaking- Choppers for DC drives - inching and closed loop drive systems.