## COURSE STRUCTURE
### III YEAR – I SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UGEE5T01</td>
<td>Control Systems</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>UGEE5T02</td>
<td>Power Systems-II</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>UGEE5T03</td>
<td>Electrical Machines-III</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>UGEE5T04</td>
<td>Power Electronics</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>UGMB5T01</td>
<td>Management Science</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

**Elective-I/ MOOCS**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>UGEE5T05</td>
<td>High Voltage Engineering</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>UGEE5T06</td>
<td>Special Electrical Machines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UGEE5M07</td>
<td>MOOCS-I – Internal Evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UGEE5M08</td>
<td>MOOCS-II – External</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>UGEE5P09</td>
<td>AC Machines Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>UGEE5P10</td>
<td>Control Systems Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
</tbody>
</table>

**Audit Course**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>UGBS5A01</td>
<td>Technical Writing</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Total**

### III YEAR – II SEMESTER

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UGEE6T01</td>
<td>Utilization of Electrical Energy</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>UGEE6T02</td>
<td>Microprocessors &amp; Microcontrollers</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>UGEE6T03</td>
<td>Power System Analysis</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>UGEE6T04</td>
<td>Power Semiconductor Drives</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>UGEC6T04</td>
<td>Linear &amp; Digital IC</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

**Elective – II/ MOOCS**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>UGEE6T05</td>
<td>Electrical Machine Design</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>UGEE6T06</td>
<td>Electrical Distribution Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UGEE6M07</td>
<td>MOOCS-III – Internal Evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>UGEE6M08</td>
<td>MOOCS-IV – External Evaluation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>UGEE6P09</td>
<td>Power Electronics Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>UGEC6P12</td>
<td>IC&amp;PDC Lab</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>1</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
</tbody>
</table>

**Audit Course**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>UGMB6A01</td>
<td>Economics for Engineers</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Subject Code</th>
<th>Subject Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>I</th>
<th>E</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>21</td>
<td>4</td>
<td>6</td>
<td>22</td>
<td>290</td>
<td>460</td>
<td>750</td>
</tr>
</tbody>
</table>
Course Objectives:

- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function.
- To analyze the time response of first and second order systems and improvement of performance by P, PI and PID controllers.
- To investigate the stability of closed loop system using Routh’s stability criterion and analysis by Root locus method.
- To present frequency response approaches for the analysis of linear time invariant systems using Bode plots, polar plots and Nyquist stability criterion.
- To discuss basic aspects of design and compensation of linear control systems using Bode plots.
- Ability to formulate state models to analyze the system and to analyze the concepts of controllability and observability.

Course Outcomes:

CO1: Ability to derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.

CO2: Capability to determine the time response specifications of second order systems and to determine error constants.

CO3: Acquire skill to analyze absolute stability and relative stability of LTI systems using Routh’s stability criterion and root locus method.

CO4: Capability to analyze stability of LTI systems using frequency response methods.

CO5: Able to design Lag, Lead, Lag-Lead compensators to improve systems performance using Bode diagram.

CO6: Ability to represent physical systems as state models and determine the response and understanding the concepts of controllability and observability.

SYLLABUS

UNIT-I
MATHEMATICAL MODELING AND TRANSFER FUNCTION REPRESENTATION:

Introduction: Concepts of control systems – open loop and closed loop control systems and their differences, Classification of control systems and Feedback characteristics, effects of feedback
Mathematical models and Transfer functions of Physical systems: Mathematical models-differential equations, Impulse response and transfer functions-Translational and rotational mechanical systems-Block diagram algebra-Representation by signal flow graph reduction using mason’s gain formula

Components of control systems: Transfer function of DC servo motor – AC servo motor–synchro transmitter & receiver

UNIT-II
TIME RESPONSE ANALYSIS
Standard test signals - Time response of first order systems – Time response of second order systems - Time domain specifications – Steady state errors and error constants – Effects of proportional derivative, proportional integral systems Effect of adding poles and zeros to standard second order system- dominant poles of transfer functions

UNIT – III
STABILITY ANALYSIS AND ROOT LOCUS TECHNIQUE
The concept of stability – Routh’s stability criterion - limitations of Routh’s stability
The root locus concept - construction of root loci (simple problems)

UNIT – IV
FREQUENCY RESPONSE ANALYSIS
Introduction, Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar plots, Nyquist Stability criterion

UNIT – V CLASSICAL CONTROL DESIGN TECHNIQUES
Lag, Lead, Lag- Lead compensators – using Bode plots

UNIT – VI
State Space Analysis of Continuous Systems
Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it’s Properties – Concepts of Controllability and Observability.
Text books:

Reference books:
1. Control Systems, Manik Dhanesh N, Cengage publications
POWER SYSTEMS- II

III Year I Semester

Subject Code: UGEE5T02

Course Objectives:

• To compute inductance and capacitance of transmission lines and to understand the concepts of GMD, GMR.
• To study short and medium length transmission lines, their models and performance computation.
• To study the performance and modeling of long transmission lines.
• To study the transient on transmission lines.
• To study the factors affecting the performance of transmission lines and power factor and Voltage control improvement methods.
• To discuss sag and tension computation of transmission lines as well as to study the overhead insulators.

Course Outcomes

CO1: Able to understand parameters of various types of transmission lines.
CO2: Able to understand the insight into specific transmission lines short and medium type which would have application in medium and high voltage power transmission systems.
CO3: Student will be able to understand the performance of long transmission lines and corona principle.
CO4: Will be able to understand the power system transients
CO5: Will be able to understand the mechanical design of overhead lines and insulators.
CO6: Will be able to understand physical and geometrical parameters of transmission line for safe and efficient performance during operating condition of voltage and power

SYLLABUS

UNIT–I:

Transmission Line Parameters
UNIT–II:
Performance of Short and Medium Length Transmission Lines

UNIT–III:
Performance of Long Transmission Lines

UNIT – IV:
Power System Transients

UNIT–V:
Various Factors Governing the Performance of Transmission line
Skin and Proximity effects – Description and effect on Resistance of Solid Conductors –Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Power factor improvement and voltage control methods.

UNIT–VI:
Sag and Tension Calculations and Overhead Line Insulators
Text Books:

Reference Books:
ELECTRICAL MACHINES- III

III Year I Semester

Subject Code: UGEE5T03

Course objectives:

- To study the application of “Double revolving field” theory for single – phase induction motor and appreciate the function and application of A.C series motor.
- To discuss e.m.f generation principle of synchronous generator and armature reaction effect.
- To study the effect of load at different power factors, methods of predetermination of regulation for non– salient and salient pole generators.
- To study the parallel operation and the concepts of transfer of real and reactive powers.
- To understand the operation and performance of synchronous motor.
- To study the power circle diagrams and methods of starting of synchronous motor.

Course Outcomes:

CO1: Able to analyze the performance of single phase induction and ac series motors.
CO2: Able to explain the structure of synchronous machines and design the windings.
CO3: Will be able to develop solutions for regulation of both non salient pole and salient pole synchronous generators.
CO4: Able to explain the role of synchronous generators operation when connected to an infinite bus or when operating in parallel.
CO5: Analyze the performance of synchronous motor for development of torque and power factor correction.
CO6: Able to understand the starting of synchronous motor performance

SYLLABUS

UNIT – I:
Single Phase Motors
Single phase induction motors – Constructional features and the problem of starting–Double revolving field theory–AC Series motor–Compensation-

UNIT–II:
Synchronous generator construction and operation
UNIT – III:
Voltage regulation of synchronous generator

UNIT –IV:
Parallel operation of synchronous generators
Parallel operation with infinite bus and other alternators – Synchronizing power – Load sharing – Transfer of real and reactive power–Effect of change of excitation and mechanical power input- Numerical problems.

UNIT–V:
Synchronous motor – operation
Synchronous Motor principle and theory of operation– Phasor diagram – Starting torque– Variation of current and power factor with excitation –Synchronous condenser – Mathematical analysis for power developed– Numerical problems.

UNIT – VI:
Synchronous motor performance and starting
Excitation and power circles – Hunting and its suppression – Methods of starting – Synchronous induction motor.

Text Books:


Reference Books:

POWERS ELECTRONICS

III Year I Semester

Subject Code: UGEE5T04

Course Objectives:

- To prepare the students to know the characteristics of different power electronic switches, drivers and selection of components for different applications.
- To develop students to design different power electronic topologies for different applications.

Course Outcomes:

CO1: Able to demonstrate both steady state as well as dynamic characteristics of various power semiconductor devices and to analyze the operation of diode bridge rectifier.

CO2: Able to apply the knowledge for designing firing circuits of SCR and to analyze the operation of phase controlled converters.

CO3: To analyze different electrical parameters of single phase converters for different loads and to evaluate the converters performance.

CO4: Able to explicate the operation of three phase full–wave converters and dual converter.

CO5: Ability to analyze various ac-ac and dc-dc converter topologies.

CO6: Capability to explain the working of inverters and to develop PWM techniques for voltage control and harmonic mitigation.

SYLLABUS

UNIT–I:
Power Semi Conductor Devices

UNIT–II:
Phase Controlled Converters – Single Phase
UNIT–III:
**Single Phase Bridge Converter and Harmonic Analysis**

**Fully controlled converters:**

**Semi Converters (Half Controlled):**
Operation with R, RL and RLE loads – Harmonic analysis for input current waveform in a system with a large load inductance –Calculation of input power factor.

UNIT–IV:
**Three Phase AC–DC Bridge Converters**

UNIT – V:
**AC–AC and DC–DC Converters**

UNIT – VI:
**DC–AC Inverters**

**Inverters**
Text Books:
2. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.

Reference Books:
MANAGEMENT SCIENCE

III Year I Semester

Subject Code: UGMB5T01

Course Objective:

To enlighten the technical students with functional management related issues like Principles of Management, Operations Management, HRM, MM, Project Management techniques.

Course Outcomes:

Upon completion of this course students gain knowledge on:

- CO1: Principles of Management
- CO3: Issues related to HRM
- CO4: Concepts of Marketing
- CO5: Project management techniques
- CO6: Strategy formulation & implementation.

Syllabus

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction to Management</strong></td>
</tr>
<tr>
<td></td>
<td>Concept and importance of Management, Functions of management, Evaluation of Management thought, Fayol’s principles of Management, Fayol’s principles of Management, Herzberg’s two factor theory of Motivation, Decision making process, Designing organizational structure, Principles of Organization, Types of organization structures</td>
</tr>
<tr>
<td>II</td>
<td><strong>Operations management.</strong></td>
</tr>
<tr>
<td></td>
<td>Principles and types, Work study, Statistical Quality control</td>
</tr>
<tr>
<td></td>
<td>Charts – R Chart, c chart, p chart, Simple problems on R, c and p charts, Materials Management: Objectives - need for inventory control- EOQ , ABC , HML, SDE, VED and FSN analysis</td>
</tr>
<tr>
<td>Section</td>
<td>Course</td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>III</td>
<td><strong>Human Resources management</strong>&lt;br&gt;(HRM): concepts of HRM, HRD &amp; Personnel management and industrial relations, Basic functions of HR manager Wage payment plans (simple problems) Job evaluation and merit Rating</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Marketing Management</strong>&lt;br&gt;Functions of marketing - Marketing Mix - Marketing strategies based on Product life cycle Channels of distribution</td>
</tr>
<tr>
<td>V</td>
<td><strong>Project Management (PERT/CPM)</strong>&lt;br&gt;Network analysis Programme Evaluation and Review Technique (PERT) Critical path method(CPM) Identifying critical path Difference between PERT &amp; CPM Probability Project Crashing (simple problems)</td>
</tr>
<tr>
<td>VI</td>
<td><strong>Strategic Management</strong>&lt;br&gt;Mission, Goals, objectives, policy, strategy Elements of corporate planning process, Environmental scanning SWOT analysis Steps in strategy formulation and implementation Generic strategy alternatives</td>
</tr>
</tbody>
</table>
Text Books

1. Dr. Arya Sri – Management Science, TMH 2011

Reference Books:

1. Production and Operations Management- K.ASWATHAPPA and K.SRIDHARA BHAT
2. Marketing Management- PHILIP KOTLER
3. HRM & IR- P.SUBBA RAO
HIGH VOLTAGE ENGINEERING
(ELECTIVE-I)

III Year I Semester

Subject Code: UGEE5T05

Course Objectives:
- To teach importance, principles, and methods of HV generation and measurement
- To teach why we use high voltage (HV) and to introduce HV problems and HV applications
- To teach analytical, numerical and experimental electrostatic field computation methods and to evaluate discharge phenomena at high electric fields
- To introduce basic breakdown phenomena and their properties at gas, solid, and liquid dielectrics
- To provide origins of overvoltage and protection against them.

Course Outcomes:
CO1: To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
CO2: To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials.
CO3: To acquaint with the techniques of generation of AC, DC and Impulse voltages.
CO4: To be able to apply knowledge for measurement of high voltage and high current AC, DC and Impulse.
CO5: To be in a position to measure dielectric property of material used for HV equipment.
CO6: To know the techniques of testing various equipment’s used in HV engineering.

SYLLABUS

UNIT–I:
Introduction to High Voltage Technology
Electric Field Stresses – Uniform and non-uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT–II:
Breakdown phenomenon in gaseous, liquid and solid insulation
breakdown – Thermal breakdown – Breakdown of solid dielectrics in practice – Breakdown in composite dielectrics used in practice.

UNIT–III:
**Generation of High voltages and High currents**

UNIT–IV:
**Measurement of high voltages and High currents**
Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT–V:
**Non-destructive testing of material and electrical apparatus**

UNIT–VI:
**High voltage testing of electrical apparatus**

Text Books:


Reference Books:

SPECIAL ELECTRICAL MACHINES
(ELECTIVE-I)

III Year I Semester

Subject Code: UGEE5T06

Course objectives:

- Understand the concepts of switched reluctance motor.
- To understand the operation and performance of stepper motor
- To understand the operation and performance of Permanent magnet DC motor
- To understand the operation and performance of Permanent Magnet Brushless DC Motor
- To understand the operation and performance of Linear Motors
- To understand the operation and performance of Electric Motors for traction drives

Course Outcomes:

- CO1: Able to understand the concepts of Switched Reluctance motor
- CO2: Learn the concepts of Stepper Motors
- CO3: Acquire knowledge on the concepts of Permanent Magnet DC Motors
- CO4: Understand working of Permanent Magnet Brushless DC Motor
- CO5: Learning the construction and operation of Linear motors
- CO6: Able to understand the concepts of Electric Motors for traction drives

SYLLABUS

Unit I:
Switched Reluctance Motor
Principle of operation – Design of stator and rotor pole arc – Power converter for switched reluctance motor – Control of switched reluctance motor.

Unit II:
Stepper Motors

Unit III:
Permanent Magnet DC Motors
Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors.
Unit IV:
Permanent Magnet Brushless DC Motor

Unit V:
Linear motors

Unit VI:
Electric Motors for traction drives
AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

Text Books:
AC MACHINES LAB

III Year I Semester

Subject Code: UGEE5P09

Course Objective:

- To perform OC and SC test and sumpner’s test on single phase transformer and assess
  their performance.
- To conduct No–load & Blocked rotor tests and Brake test on three phase Induction motor
- To predetermine the regulation of three–phase alternator by synchronous impedance
  method
- To obtain the performance curves of three—phase synchronous machine

Course Outcomes:

CO1: Able to predetermine the efficiency and regulation of single-phase transformer at given
  power factors and determine its equivalent circuit.

CO2: Able to obtain performance characteristics three-phase Induction motor

CO3: To predetermine the regulation of three–phase alternator by synchronous impedance
  method

CO4: To determine $X_d$ and $X_q$ of a salient pole synchronous machine

CO5: Able to obtain the V and Inverted V curves of a three—phase synchronous motor

SYLLABUS

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

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner’s test on single phase transformers
3. Scott connection of transformers
4. No–load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance &m.m.f.
   Methods
7. Equivalent Circuit of a single phase induction motor
8. Determination of $X_d$ and $X_q$ of a salient pole synchronous machine
In addition to the above eight experiments, at least any two of the following experiments are required to be conducted from the following list:

1. Parallel operation of Single phase Transformers
2. Separation of core losses of a single phase transformer
3. Brake test on three phase Induction Motor
4. Regulation of three–phase alternator by Potier triangle method.
5. Efficiency of a three–phase alternator
6. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
CONTROL SYSTEMS LAB

III Year I Semester

Subject Code: UGEE5P10

Course Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
- To understand time and frequency responses of control system with and without controllers and compensators.

Course Outcomes:

CO1: Describe the characteristics of synchros and magnetic amplifiers.
CO2: Determine the root locus, bode plot and state space model equations for the given transfer function of linear time invariant systems by using Simulation tools.
CO3: Determine the transfer function of DC machine.
CO4: Design compensation networks for linear time invariant systems.
CO5: Illustrate the effects of P, PD, PID controllers.

SYLLABUS

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of DC motor
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Characteristics of DC servo motor
13. Potentiometer as an error detector
TECHNICAL WRITING (Audit Course)

III Year I Semester

Subject Code: UGBS5A01

Course Objectives:
- To be able to write or speak cohesively and coherently and flawlessly avoiding grammatical errors, using a wide range expressions, organizing the ideas logically on a topic.
- To make the students understand various formal ways of writing and
- To acquaint students with professional communication in writing.

Course Outcomes:
CO1: Enables students to use English effectively in formal and informal contexts.
CO2: Introduces learners to different forms of written and oral communication in their career.
CO3: Exposes students to latest developments in various communication modes.

SYLLABUS

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>No. of Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT-1 : Routine written communication</td>
<td>3</td>
</tr>
<tr>
<td>Notes/messages</td>
<td></td>
</tr>
<tr>
<td>Memorandum</td>
<td></td>
</tr>
<tr>
<td>Circular / Notice</td>
<td></td>
</tr>
<tr>
<td>Resume</td>
<td></td>
</tr>
<tr>
<td>Minutes of meeting</td>
<td></td>
</tr>
<tr>
<td>Email</td>
<td></td>
</tr>
<tr>
<td>Letters</td>
<td></td>
</tr>
<tr>
<td>Journal articles</td>
<td></td>
</tr>
<tr>
<td>UNIT- 2:Report writing</td>
<td>2</td>
</tr>
<tr>
<td>Proposal</td>
<td></td>
</tr>
<tr>
<td>Progress</td>
<td></td>
</tr>
<tr>
<td>Documentation</td>
<td></td>
</tr>
<tr>
<td>Project Report</td>
<td></td>
</tr>
<tr>
<td>UNIT -3:Writing for social /Digital Media</td>
<td>2</td>
</tr>
</tbody>
</table>
• Blogging
• Twitter post
• Facebook post
• Customer review

UNIT-4: Redesigning a user manual/instruction manual/installation manual

UNIT-5: Presentation
• Oral
• Written
• Poster
• Product launch
• Research paper/Conference paper

UNIT-6: Mechanics of writing
• Grammar
• Punctuation
• Vocabulary
• Use of computer technology

Suggested Reading:

UTILIZATION OF ELECTRICAL ENERGY

III Year II Semester
Subject Code: UGEE6T01

Course Objectives:

- To understand the operating principles and characteristics of traction motors with respect to speed, temperature and loading conditions.
- To acquaint with the different types of heating and welding techniques.
- To study the basic principles of illumination and its measurement.
- To understand different types of lightning system including design.
- To understand the basic principle of electric traction including speed–time curves of different traction services.
- To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management of energy.

Course Outcomes:

1. Able to identify a suitable motor for electric drives and industrial applications
2. Able to identify most appropriate heating or welding techniques for suitable applications.
3. Able to understand various level of luminosity produced by different illuminating sources.
4. Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
5. Able to determine the speed/time characteristics of different types of traction motors.
6. Able to estimate specific energy consumption for given run and to understand the principles of energy efficient motors.

SYLLABUS

UNIT – I:
Selection of Motors
Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II:
Electric Heating
Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.
Electric Welding
Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – III:
Illumination fundamentals
Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Sources of light

UNIT – IV:
Various Illumination Methods
Discharge lamps, MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting.

UNIT – V:
Electric Traction – I
System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

UNIT – VI:
Electric Traction – II
Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking retardation adhesive weight and coefficient of adhesion–Principles of energy efficient motors.

Text Books:

Reference Books:
MICROPROCESSORS & MICROCONTROLLERS

III Year II Semester

Subject Code: UGEE6T02

Course Objectives:

1. Students will understand the relationship between hardware and software specifically how machine organization impacts the efficiency of applications written in a high-level language.
2. Students will have a detailed idea about processor architecture
3. Program microcomputer using assembly language programming
4. Interfacing different I/O devices and converters.
5. Have knowledge on Interrupts & timers

Course Outcomes:

Upon completion of this course, students are able to:

CO1: Describe the structure and functioning of a digital computer
CO2: Understand the microprocessor capability in general and explore the evolution of microprocessors.
CO3: Write programs to implement designs using appropriate computer language,
CO4: Interface external devices to a microprocessor-based system using a programmable interface device,
CO5: Identify the different interrupts and timers in Microcontroller based system.
CO6: Investigate typical applications of microcontroller-based systems.

SYLLABUS

UNIT- I:
Basic Structure of computers & Memory System

UNIT–II:
Introduction to Microprocessor & Modes of Operations
Evolution Of Microprocessors, Architecture of 8086, Register organization of 8086, Memory organization of 8086, General bus operation of 8086, Minimum mode operation of 8086, Maximum mode operation of 8086 (Read and write cycles timing diagrams)
UNIT–III:
Programming of 8086
Instruction set, Addressing modes, Assembly directives, Algorithm for implementation of FOR, WHILE, REPEAT, IF-THEN-ELSE loops, Simple programming.

UNIT–IV:
I/O Interface

UNIT–V:
Introduction to 8051 Micro Controller

UNIT– VI:
Programming of 8051 & Industrial Applications
Addressing modes and instruction set of 8051, Introduction to Assembly language programming of 8051, Interfacing 8051 to LED’S, Push button, Relays, Latch connections, Keyboard interfacing, Interfacing seven segment display, Stepper Motor Interfacing

Text Books:

Reference Books:
POWER SYSTEM ANALYSIS

III Year II Semester

Subject Code: UGEE6T03

Course Objectives:

1. To study Power system Network matrices and network topology
2. To study the Gauss Seidel, Newton Raphson methods.
3. To study the decoupled and fast decoupled load flow methods.
4. To study short circuit calculation for symmetrical faults.
5. To study the effect of unsymmetrical faults.
6. To study the stability analysis of power systems

Course Outcomes:

1. Able to understand graph theory and form a $Y_{bus}$ and $Z_{Bbus}$ matrix for a power system network with or without mutual couplings.
2. Able to understand the power flow studies and find out the load flow solution of a power system network using Guass seidal method.
3. Will be able to understand the Power flow studies using N.R and Decouple load flow methods.
4. Able understand the Per unit system and symmetrical fault analysis
5. Will be able to understand the symmetrical components and unbalanced fault analysis
6. Able to analyze the steady state, transient and dynamic stability concepts of a power system

SYLLABUS

UNIT –I:
Topology and power system network matrices

Graph theory definition – Formation of element node incidence and bus incidence matrices
Primitive network representation – Formation of $Y$–bus matrix by singular transformation and direct inspection methods.Formation of $Z$–Bus: Partial network– Algorithm for the Modification of $Z_{bus}$ Matrix for addition element for the following cases: Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems)

UNIT –II:

Power Flow Studies-I

UNIT –III:
Power Flow Studies-II
Newton Raphson Method in (Rectangular and polar coordinates form) –Derivation of Jacobian matrix - Decoupled and Fast Decoupled methods (Algorithmic approach) –Problems on 3–bus system only.

UNIT – IV:
Symmetrical Fault Analysis
Per Unit Quantities–Single line diagram– Impedance diagram of a power system–3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations.

UNIT –V:
Unsymmetrical Fault Analysis

UNIT – VI:
Power System Stability Analysis


Text Books:

Reference Books:
POWER SEMICONDUCTOR DRIVES

III Year II Semester
Subject Code: UGEE6T04

Course Objective:
- To prepare the students to know the electrical and mechanical characteristics of different motors.
- To develop the students to choose a proper converter to a specified motor for different applications.
- To evaluate and enhance the performance of the drive systems under various operating conditions.

Course Outcomes:
CO1: Will be able to understand the basics of electric drives
CO2: Will be able to demonstrate the operation of three phase converter fed DC motors.
CO3: Able to apply the knowledge of dc-dc converter for speed and torque control of DC motors during both motoring and braking mode.
CO4: Able to analyze both mechanical and electrical characteristics using stator side voltage and frequency control of Induction motors.
CO5: Able to evaluate various slip power recovery schemes of Induction motor control on rotor side.
CO6: Able to explain the closed loop operation of Synchronous Motors.

SYLLABUS

UNIT–I:
Fundamentals of Electric Drives

UNIT–II:
Three phase converter controlled DC motors
Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Numerical problems – Four quadrant operation using dual converters.
UNIT–III:
Control of DC motors by DC–DC converters (Type C & Type D)
Single quadrant – Two quadrant and four quadrant chopper fed separately excited and series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operations – Closed loop operation (Block diagrams only).

UNIT–IV:
Induction motor control – Stator side
Variable voltage characteristics–Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by voltage source inverter –PWM control – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT–V:
Control of Induction motor – Rotor side

UNIT–VI:
Control of Synchronous Motors
Separate control &self control of synchronous motors – Operation of self controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (Block Diagram Only) –Variable frequency control–Pulse width modulation.

Text Books:

Reference Books:
1. Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.
3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
LINEAR & DIGITAL IC APPLICATIONS

III Year II Semester  
Subject Code : UGEC6T04

Course Objectives

To introduce the basic building blocks of linear integrated circuits. To teach the linear and non-linear applications of operational amplifiers. To introduce the theory and applications of PLL. To introduce the concepts of waveform generation and introduce some special function ICs.

Course Outcomes

CO1: Understand the terminal characteristics of op-amps and design /analyse fundamental circuits based on op-amps.
CO2: Learn the various applications of the Integrated Circuits.
CO3: Design and analysis of various applications using op-amps and various IC’s
CO4: Able to apply theory and realize analog filter circuits & D to A and A to D Convertors
CO5: They can know the differences between Linear and Digital Integrated IC’s

UNIT–I Introduction To Operational Amplifier

Block diagram of Typical Op–Amp With Various Stages– BJT Differential Amplifier With RE

UNIT–II OP–AMP Parameter


UNIT–III Ideal Operational Amplifier Theory and Basic Circuits

Ideal operational amplifier properties–Ideal assumptions–Basic circuits such as non inverting type comparator–Inverting type comparator–Voltage follower– Inverting amplifier–Non–inverting amplifier–Summing amplifier–Non–inverting summing amplifier–sub-tractor–

UNIT–IV Wave form generator in angular waveform generator using op–amps and PLL

UNIT–V Active filters

UNIT–VI D to A and A to D Convertors

Analog to Digital Convertors
Introduction–Specifications–Parallel comparator type–Counter type–Dual slope–Successive approximation type ADCs– Merits and demerits of each type, Comparison of different types.

Text Books
T1.OP–AMPS and linen integrator circuits by Ramakanth A Gayakwad (PHI)
T2.Linear Integrated Circuits by D.Roy chowdary, New age international

References
R2.Analog Electronics– L.K.Maheswari, PHI
R3.Linear Integrated circuits by S.Salivahan , TMH.
ELECTRICAL MACHINE DESIGN

III Year II Semester

Subject Code: UGEE6T05  L    T    P    C
                                      3    -    -    3

Course objectives:
- To Study the basic concepts of electrical machines
- Understand the concepts of Armature winding both AC & DC
- Understand the basic concepts of design of DC Machines.
- Understand the basic concepts of design of Transformers
- Understand the basic concepts of design of Induction motors.
- Understand the basic concepts of design of Synchronous Machines

Course Outcomes
CO1. Able to learn the Design concepts of Electrical Machines.
CO2. Able to understand the concepts of Armature Windings.
CO3. Understand the design parameters of DC Machines.
CO4. Able to understand the design aspects of transformers.
CO5. Able to understand the stator and rotor design aspects of Induction Motors.
CO6. Know the main dimensions of the Synchronous Machines design.

SYLLABUS

UNIT-I:
Introduction to Electrical Machine Design

UNIT-II:
Armature Windings (DC&AC)
Single layer winding, two layer winding, lap and wave windings, concept of pole pitch, emf generation-full pitch coil, fractional pitch coil and concentrated winding.

UNIT-III:
DC Machines
UNIT-IV:
Transformers
Construction-Comparison of Core and Shell type, Single and Three phase Transformer comparison. Core and Yoke Design-cross section, construction, cooling of transformers, Number of tubes. - Transformer windings, Coil design, Output equation, determination of number of turns and length of mean turn of winding, Resistance, Leakage reactance, no load current calculation, losses and efficiency.

UNIT-V:
Induction Motors
Principles of operation, choice of specific electric and magnetic loadings, Stator Design (Frames), output equation, choice of conductor rating, stator winding, stator slots-Squirrel cage rotor design-air gap length, rotor slots and rotor bars. Design of wound rotor-rotor slots, windings, short circuit (blocked rotor currents).

UNIT-VI:
Synchronous Machines
Constructional features-short circuit ratio-Output equation-Specific loadings-Main dimensions-Stator design-Design of Salient Pole field coil.

Text books:

Reference books:
1. “Performance and Design of DC Machines”, Clayton & Hancock, ELBS.
2. “Performance and Design of AC Machines”, M.G.Say; Pitman, ELBS.
ELECTRICAL DISTRIBUTION SYSTEMS

III Year II Semester

Subject Code: UGEE6T06

Course Objectives:

1. To study different factors of Distribution system.
2. To study and design the substations and distribution systems.
3. To study the determination of voltage drop and power loss.
4. To study the distribution system protection and its coordination.
5. To study the effect of compensation on p.f improvement.
6. To study the effect of voltage control on distribution system.

Course outcomes:

CO1: Able to understand the various factors of distribution system.
CO2: Able to design the substation and feeders.
CO3: Able to determine the voltage drop and power loss.
CO4: Able to understand the protection and its coordination.
CO5: Able to understand the effect of compensation on p.f improvement.
CO6: Able to understand the effect of voltage, current distribution system performance

SYLLABUS

UNIT – I:
General Concepts
Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT – II:
Substations
Location of substations: Rating of distribution substation – Service area within primary feeders – Benefits derived through optimal location of substations.
Distribution Feeders
Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.
UNIT – III:
System Analysis

UNIT – IV:
Protection
Coordination
Coordination of protective devices: General coordination procedure – Residual current circuit breaker RCCB (Wikipedia).

UNIT – V:
Compensation for Power Factor Improvement

UNIT – VI:
Voltage Control

Text Book:


Reference Books:

POWER ELECTRONICS LAB

III Year II Semester

Subject Code: UGEE6P09  

Course Objectives
To verify the operation and characteristics of power electronic devices.

Course Outcomes
CO 1 Able to verify the Characteristics and Turn On & Turn OFF instants of SCR, MOSFET & IGBT
CO 2 Able to analyze the operation and output voltage of bridge rectifiers and Inverters with R,RL loads.
CO 3 Understand the circuit operation DC–DC buck and boost converters.

SYLLABUS

Any 10 of the Following Experiments are to be conducted
1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR’s
3. Single -Phase Half controlled converter with R and RL load
4. Single -Phase fully controlled bridge converter with R and RL loads
5. Single -Phase AC Voltage Controller with R and RL Loads
6. Single -Phase Cyclo–converter with R and RL loads
7. Single -Phase Bridge Inverter with R and RL Loads
8. Single -Phase dual converter with RL loads
9. Three -Phase half controlled bridge converter with RL load.
10. Three- Phase full converter with RL–load.
11. DC–DC buck converter.
12. DC–DC boost converter.
15. Forced commutation circuits(Class A, Class B, Class C, Class D and Class E)
Course Objectives
To introduce the basic building blocks, theory and applications of linear integrated circuits. To develop ability among students for problem formulation, system design and solving skills.

Course Outcomes
CO 1 Students will be able to build, design and analyze OP AMP circuits
CO 2 Students will be able to build, design and analyze filter circuits
CO 3 Understand the circuit operation of the 555 timer IC and regulator IC.
CO 4 Students will be able to build, design and analyze analog to digital conversion.
CO 5 Students will be able to build, design and analyze pulse and digital circuits.

Any five experiments are to be conducted from each section

Section A: Linear IC Applications
1. OP AMP Applications
   a. Adder
   b. Subtractor
   c. Comparator
   d. Schmitt Trigger
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications
   a. LPF and HPF (first order)
4. IC 741 Oscillator Circuits
   a. RC Phase Shift Oscillator
   b. Wien Bridge Oscillator
5. IC 555 Timer
   b. Astable Operation Circuit.
6. 4 bit DAC using OP-AMP.

Section B: Pulse And Digital Circuits
By Designing the circuit:
1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non Linear wave shaping – Clippers, Clampers
3. Astable Multivibrator. (Voltage- Frequency convertor)
5. UJT Relaxation Oscillator.
6. Sampling Gates
Course Objective:

To create awareness on application of economic & accounting concepts in the organization for engineering students. In this regard they gone through demand analysis, cost concepts, production functions & fundamentals of Accounting.

Course Outcomes:

Upon completion of this course students gain knowledge on:

- Demand analysis
- Cost analysis
- Production
- Market structure
- Forms of business
- Capital budgeting
- Financial accounting

Syllabus

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPICS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Introduction to Managerial Economics</strong></td>
</tr>
<tr>
<td>I</td>
<td>Definition, Nature and Scope, Relationship with other areas in Economics</td>
</tr>
<tr>
<td></td>
<td><strong>Demand Analysis</strong>: Demand Determinants, Law of Demand and its exceptions.</td>
</tr>
<tr>
<td></td>
<td>Elasticity of demand, types and significance of Elasticity of Demand - Measurement of price Elasticity of Demand – Need for Demand forecasting, forecasting techniques</td>
</tr>
<tr>
<td>II</td>
<td></td>
</tr>
<tr>
<td>Section</td>
<td>Topic</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>Production Function</strong></td>
<td>Isoquants and Isocosts, MRTS, Laws of Variable Proportion Economies of Scale. Cobb-Douglas Production Function</td>
</tr>
<tr>
<td><strong>Cost Analysis</strong></td>
<td>Cost concepts, Opportunity cost, Fixed Vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA) - determination of Break-Even Point (simple Problems)</td>
</tr>
<tr>
<td><strong>Market Structure and Pricing practices</strong></td>
<td>Features and Types of different Markets – Price- Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly both in the long run and short run. Meaning, Methods of pricing</td>
</tr>
<tr>
<td><strong>Types Of Business Organization And Business Cycles</strong></td>
<td>Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types – Business cycles, meaning, features and Phases of Business Cycle</td>
</tr>
<tr>
<td><strong>Capital Budgeting</strong></td>
<td>Capital Budgeting: Meaning of Capital Budgeting – Need for Capital Budgeting – Techniques of Capital Budgeting – Traditional and Modern Methods (simple problems)</td>
</tr>
</tbody>
</table>
Text Books

4. P L Mehata, Managerial Economics, Sultan Publications
5. Dr. Arya Sri – Managerial Economics & Financial Analysis, TMH 2011

Reference Books:

2. R K Sharma shashi k Gupta: Management accounting