## I SEMESTER

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# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks

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* CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks

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* CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks


LB – Laboratory
### V SEMESTER

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# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks

* TA – Theory Category A, TB – Theory Category B, TC – Theory Category C,
TX – Theory Course (Category TA / TB / TC / TCP)
LB – Laboratory, PR - Practice
### VII SEMESTER

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*CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks

* TA – Theory Category A, TB – Theory Category B, TC – Theory Category C,
TX – Theory Course (Category TA / TB / TC / TCP)
LB – Laboratory, PR - Practice
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<td>3 L, 1 T, 4 C</td>
<td>40 CA, 60 SE, 100 TM</td>
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</table>

**Prerequisite:** -

**Objectives:**
- To introduce the ideas of differential and integral calculus
- To familiarize students with functions of several variables
- To introduce methods for solving differential equations

**Outcome:**
- Understands Calculus
- Functions of several variables
- Able to solve differential equations

**UNIT – I**

Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

**UNIT – II**

Partial derivatives, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians and their properties, Partial differentiation of implicit functions, Maxima and minima of functions of two variables, Lagrange’s method of undetermined multipliers.

**UNIT – III**

Multiple Integrals, change of order of integration in double integrals, Applications: Plane areas (double integration), Change of variables (Cartesian to polar), volumes by solids of revolution, double and triple integrations (Cartesian and polar) – Center of mass and Gravity (constant and variable densities).

**UNIT – IV**

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

**UNIT – V**

Linear differential equations of higher order - with constant coefficients, the operator D, Euler’s linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method.

**Total contact Hours: 45**
**Total Tutorials: 15**
**Total Practical Classes:**
**Total Hours: 60**

**Text Books:**


**Reference Books:**

**Department:** Physics  
**Programme:** B.Tech.  
**Semester:** First  
**Category:** TA

<table>
<thead>
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<td>PH101</td>
<td>Engineering Physics</td>
<td>4 - - - -</td>
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**Prerequisite:** -

**Objectives:**
- To provide a bridge between basic Physics and Engineering courses.
- To introduce the concepts and applications of Ultrasonics, Optics, Lasers, Optical Fibers, and wave mechanics and fundamentals of crystal structure.

**Outcome:** At the end of the course, Students would have adequate exposure to the concepts of the various topics of this Engineering Physics course and their real life applications.

**UNIT – I ACOUSTICS & ULTRASONICS**  
**Hours: 12**


**UNIT – II OPTICS**  
**Hours: 12**

**Interference:** Air Wedge – Michelson’s Interferometer – Types of fringes- Determination of Wavelength of a light source– Antireflection Coatings -Interference Filter; **Diffraction:** Concept of Resolution of Spectral lines-Rayleigh’s criterion -Resolving Power of Grating, Prism & Telescope; **Polarisation:** Basic concepts of Double Refraction and Optical Rotation- Quarter and Half Wave Plates – Specific Rotatory Power – Laurent’s Half Shade Polarimeter- polarizing filters

**UNIT – III CRYSTAL STRUCTURE AND LATTICE DEFECTS**  
**Hours: 12**

**Crystal structure:** Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices- Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, HCP structures – Miller Indices- Powder X Ray Diffraction Method; **Lattice Defects:** Qualitative ideas of point, line, surface and volume defects and their influence on properties of solids

**UNIT – IV WAVE MECHANICS**  
**Hours: 12**

**Matter Waves – de Broglie hypothesis – Uncertainty Principle – Schrodinger Wave Equations – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box – Concept of Quantum Mechanical Tunneling (without derivation) – Applications of tunneling (qualitative) to Alpha Decay, Tunnel Diode, Scanning Tunneling Microscope.

**UNIT – V LASERS & FIBER OPTICS**  
**Hours: 12**

**Lasers:** Principles of Laser – Spontaneous and Stimulated Emissions - Einstein’s Coefficients – population Inversion and Laser Action –optical resonators(qualitative)- Types of Lasers – Nd:YAG, CO₂ laser, GaAs Laser- Industrial & Medical applications of Lasers; **Fiber Optics:** Principle and Propagation of light in optical fiber– Numerical aperture and acceptance angle – Types of optical fibers-based on Material, refractive index profile, Modes of propagation( single & Multimode Fibres) -Qualitative ideas of attenuation in optical Fibers-Applications of Optical Fibers- Fibre Optic communication (Schematic), Active and passive fibre optic sensors, Endoscope

**Total contact Hours: 60  Total Tutorials: -  Total Practical Classes: -  Total Hours: 60**

**Text Books:**

**Reference Books:**
<table>
<thead>
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<th>Department : Chemistry</th>
<th>Programme : B.Tech</th>
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<td>Engineering Chemistry</td>
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</table>

**Prerequisite:**
- 

**Objectives:**
- To know the importance of chemistry in engineering education
- To understand the chemistry of industrial processes
- To apply the knowledge of chemistry to solve engineering problems

**Outcome:**
- Students will be able to understand and appreciate usefulness of chemistry concepts in the design, fabrication and maintenance of materials for engineering applications.
- Students will gain knowledge about the chemistry background of some of the important industrial processing techniques.
- With the knowledge gained in conceptual chemistry, engineering students will be able to approach confidently the design and development of futuristic materials to meet the requirement of industry and society.

**UNIT – I**  
**WATER TREATMENT**  
**Hours: 12**


**UNIT – II**  
**INDUSTRIAL POLYMERS**  
**Hours: 12**


**UNIT – III**  
**ELECTROCHEMICAL CELLS**  
**Hours: 12**

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

**UNIT – IV**  
**CORROSION AND CONTROL**  
**Hours: 12**


**UNIT – V**  
**ENGINEERING MATERIALS**  
**Hours: 12**


**Text Books:**

**Reference Books:**
**Course Code** | **Course Name** | **Hours / Week** | **Credit** | **Maximum Marks**
--- | --- | --- | --- | ---
BE101 | Basic Civil and Mechanical Engineering | 4 | 40 | 100

**Prerequisite:**
- To be able to differentiate the types of buildings according to national building code.
- To understand building components and their functions as well as different types of roads, bridges and dams
- To convey the basics of Mechanical Engineering
- To establish the necessity of basics of Mechanical Engineering to other engineering disciplines
- To explain the concepts of thermal plants used in power systems being a common issue
- To narrate the methods of harnessing renewable energies and their working principles
- To explain the role of basic manufacturing processes
- To develop an intuitive understanding of underlying working principles of mechanical machines and systems.

**Objectives:**
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are made to understand the principles of Mechanical Engineering based on theories.
- Students are encouraged to make engineering judgments, to conduct independent exploration of topic of renewable energy systems and to communicate the findings in a professional manner.
- Students are made to develop natural curiosity to explore the various facets of mechanical equipment and machines.
- While emphasizing basic principles, students are provided with explanations used in real time engineering systems.

**Outcome:**

**UNIT – I**
Buildings and building materials | Hours: 10
--- | ---
Buildings-Definition-NBC Classification - plinth area, floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses. Impact of manufacture and use of building materials on the environment.

**UNIT – II**
Buildings and their components | Hours: 10
--- | ---

**UNIT – III**
Basic Infrastructure | Hours: 10
--- | ---

**UNIT – IV**
IC engines – Classification – Working principles - Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits.
Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits - Applications.

**UNIT – V**
--- | Hours: 10
Power Generation Systems – Conventional and Non-Conventional:
- Hydraulic – Thermal – Nuclear power plants – Schemes and layouts (Description Only)
- Solar – wind – Geothermal – Wave – Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).

<table>
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<tr>
<th>UNIT – VI</th>
<th>Hours: 10</th>
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</table>

- Machines: Lathe – Drilling machine – Grinding machine (Description only)

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Text Books:

Reference Books:

Web sites:
1. [http://nptel.iitm.ac.in/courses/Webcourse-contents/](http://nptel.iitm.ac.in/courses/Webcourse-contents/)
Department: Civil Engineering  
Programme: B.Tech.

Semester: First / Second  
Category: TB

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<td>Engineering Mechanics</td>
<td>3 L 1 T 0 P 4 C 40 CA 60 SE 100 TM</td>
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</table>

Prerequisite: -

Objectives:
- To explain the importance of mechanics in the context of engineering.
- To understand the static equilibrium of particles and rigid bodies in two dimensions
- To introduce the techniques for analyzing the forces in the bodies.
- To study the motion of a body and to write the dynamic equilibrium equation.

Outcome:
- On successful completion of the course, a student would be able to identify and analyze the problems by applying the principles of engineering mechanics, and to proceed to advanced study on mechanical systems.

UNIT – I  
FUNDAMENTALS OF MECHANICS  
Hours: 09


UNIT – II  
APPLICATION OF FORCE SYSTEM  
Hours: 09

Types loads and supports – simply supported beams, cantilever beams and plane trusses – reactions (No analysis required).
Friction: Laws of friction, Static dry friction, simple contact friction problems, body on inclined planes, ladders, wedges, simple screw jack.

UNIT – III  
PROPERTIES OF SURFACES  
Hours: 09

Properties of sections – centroids, center of gravity, area moment of inertia, product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.
Principle of virtual work – work done – application to simple structural arrangements.

UNIT – IV  
KINEMATICS AND KINETICS OF PARTICLES  
Hours: 09


UNIT – V  
KINEMATICS AND KINETICS OF RIGID BODIES  
Hours: 09


Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:
### Course Code: HS101  
**Course Name:** Communicative English

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<td>L T P C CA SE TM</td>
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**Prerequisite:**

- To improve the LSRW skills of I. B.Tech students
- To instill confidence and enable the students to communicate with ease
- To equip the students with the necessary skills and develop their language prowess

**Objectives:**

- To communicate effectively in English
- To get rid of their inhibitions
- To possess effective language skills
- To improve their career prospects

**Outcome:**

On successful completion of the module students should be able to:

- Communicate effectively in English
- Get rid of their inhibitions
- Possess effective language skills
- Improve their career prospects

**UNIT – I  
BASIC CONCEPTS OF Communicative English**

- Definition
- Importance
- Process
- Channels and Types
- Barriers
- Strategies for Effective Communicative Listening Skills.

**UNIT – II  
COMPREHENSION AND ANALYSIS**

- Comprehension of Technical and Non-Technical Passages
  - Skimming, Scanning, Inferring
- Note-making, Predicting and responding to context
- Intensive Reading and Reviewing.

**UNIT – III  
WRITING**

- Paragraph and Essay
- Report
- Memorandum
- Instructions
- Job Application Letters
- Resume
- Email Writing.

**UNIT – IV  
ORAL COMMUNICATION**

- Basics of Phonetics
- Presentation Skills
- Group Discussions
- Extempores
- Debates
- Role Plays.

**UNIT – V  
VOCABULARY AND LANGUAGE THROUGH LITERATURE**

- Analysis of
  1. “English in India”, R.K. Narayan
  3. “Politics and the English Language”, George Orwell

- Contextual variations of language
- Interpretation of literary language
- Vocabulary building
- Nuances of language (grammar, pronunciation, spelling)
- Developing critical framework.

**Text Books:**


**Reference Books:**

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**Prerequisite:**

**Objectives:** To provide a practical understanding of some of the concepts learnt in the theory course on Physics and Materials Science.

**Outcome:** The Students would have gained practical experience about some of the Theoretical concepts learnt in the Physics and Materials Science courses.

**LIST OF EXPERIMENTS:**

(Any 10 experiments including a maximum of 2 Demonstration experiments are to be performed.)

1. Radius of curvature of a Lens - Newton’s rings
2. Thickness of a thin object by Air – wedge
3. Spectrometer – Resolving power of a Prism
4. Spectrometer – Resolving power of a Transmission grating
5. Determination of wavelength of a Laser source using transmission grating, reflection grating (vernier calipers) & particle size determination
6. Determination of numerical aperture & Acceptance angle of an optical fiber.
7. Laurent’s Half shade polarimeter – Determination of specific rotatory power*
8. Spectrometer - Hollow prism / Ordinary & Extraordinary rays by Calcite Prism*
9. Determination of optical absorption coefficient of materials using laser*
10. Coefficient of Thermal conductivity - Radial flow method
11. Coefficient of Thermal conductivity – Lee’s Disc method
12. Jolly’s Bulb Apparatus experiment – determination of α
13. Magnetism: I – H curve
14. Field along the axis of a coil carrying current
15. Vibration magnetometer – calculation of magnetic moment & pole strength
16. Electrical conductivity of semiconductor – two probe / four probe method*
17. Hall effect in a semiconductor*
18. Michelson’s Interferometer*

*Demonstration Experiments
### Course Information

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**Prerequisite:**
- To educate the principles involved in chemical analysis.
- To provide practical knowledge of handling chemicals and chemical analysis.
- To understand the importance of chemical analysis in various fields.

**Objectives:**
- Students will be able to understand chemical analysis and its usefulness in engineering, industry and other fields.
- Students will gain laboratory skills and that will give confidence in analyzing samples in engineering, industry and other fields.
- Students will gain knowledge about the principles and methods of listed methods of quantitative analyses.

**Outcome:**
- Students will be able to understand chemical analysis and its usefulness in engineering, industry and other fields.
- Students will gain laboratory skills and that will give confidence in analyzing samples in engineering, industry and other fields.
- Students will gain knowledge about the principles and methods of quantitative analyses.

**List of experiments: (Any 10 experiments)**

1. Determination of total, permanent and temporary hardness of water by EDTA method.
2. Determination of magnesium in water by complexometry.
3. Determination of calcium in lime stone by complexometry.
4. Determination of alkalinity of water.
5. Determination of percentage of acetic acid in vinegar.
6. Determination of ferrous ion in Mohr’s salt.
7. Determination of lead dioxide by permanganometry.
8. Determination of ferrous and ferric ions in a solution by dichrometry.
10. Determination of dissolved oxygen in water.
11. Determination of COD of water sample.
12. Determination of available chlorine in bleaching powder.
13. Determination of chloride content in water by argentometry.
14. Determination of lead in polluted water by conductometry.
15. Preparation of potash alum from scrap aluminium.

**Text Books:**

**Reference Books:**
### Course Information

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**Prerequisite:**
- To convey the basics of mechanical tools used in engineering
- To establish hands on experience on the working tools
- To develop basic joints and fittings using the hand tools
- To establish the importance of joints and fitting in engineering applications
- To explain the role of basic workshop in engineering
- To develop an intuitive understanding of underlying physical mechanism used in mechanical machines.

**Objectives:**
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are introduced to basic hand tools used in various mechanical cutting operations.
- Students are encouraged to make simple joints and fittings.
- Students are made to develop natural curiosity to explore the various facets of basic cutting operations.
- While emphasizing basic operations, students are provided with modern hand tools to use in real time engineering jobs.
- Students are exposed to make objects like tray, welded joints.

**Outcome:**
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are introduced to basic hand tools used in various mechanical cutting operations.
- Students are encouraged to make simple joints and fittings.
- Students are made to develop natural curiosity to explore the various facets of basic cutting operations.
- While emphasizing basic operations, students are provided with modern hand tools to use in real time engineering jobs.
- Students are exposed to make objects like tray, welded joints.

### UNIT – I
**Fitting**

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

### UNIT – II
**Welding**

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

### UNIT – III
**Sheet Metal**

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

### UNIT – IV
**Carpentry**

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint
4. Dovetail joint

**Total contact Hours:** -  | **Total Tutorials:** -  | **Total Practical Classes:** 45  | **Total Hours:** 45

**Text Books:**
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<td>MA102</td>
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**Prerequisite:**
- To acquaint with theory of Matrices
- Hyperbolic functions and theory of equations
- Vector calculus and statistics

**Objectives:**
- Understands Matrix theory
- Solving techniques of equations
- Understands Vectors and statistics

**Outline:**

**UNIT – I**

- Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values. Cayley-Hamilton Theorem, Diagonalisation of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation and nature of quadratic forms.

**UNIT – II**

- Trigonometry: Hyperbolic and circular functions, logarithms of complex number, resolving real and imaginary parts of a complex quantity.
- Theory of equations: Relation between roots and coefficients, reciprocal equations, transformation of equations and diminishing the roots.

**UNIT – III**

- Finite differences: Definitions and relation between operators (\(\Delta\), \(\nabla\), \(\delta\), \(\varepsilon\), \(\mu\), \(D\)), Solution of difference Equations, Solving Boundary value problems for ordinary differential equations using finite difference method.

**UNIT – IV**

- Gradient, divergence and curl, their properties and relations. Stoke’s theorem and Gauss divergence theorem (without proof). Simple applications involving cubes, sphere and rectangular parallelepipeds.

**UNIT – V**

- Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

**Text Books:**


**Reference Books:**

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
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<td>P</td>
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<tr>
<td>PH102</td>
<td>Material Science</td>
<td>4</td>
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**Prerequisite:**

- (Blank)

**Objectives:**

- To impart knowledge to the Engineering students about the significance of Materials Science and its contribution to Engineering and Technology
- To introduce the Physical concepts and properties of Different category of materials and their modern applications in day-to-day life.

**Outcome:**

- Engineering Students would have gained fundamental knowledge about the various types of materials and their applications to Engineering and Technology.

**UNIT – I**

**DIELECTRIC MATERIALS**

- NLO materials and piezoelectric actuators (introductory concepts).

**UNIT – II**

**MAGNETIC MATERIALS AND SUPERCONDUCTORS**

- Superconductors: Basic concepts – properties of superconductors – Meissner effect – Type I and II superconductors – BCS theory (qualitative) - High Temperature Superconductors– Qualitative ideas of Josephson effect, quantum interference and SQUID – their applications.

**UNIT – III**

**SEMICONDUCTORS**


**UNIT – IV**

**NUCLEAR REACTORS & MATERIALS**

- Nuclear fusion reactions for fusion reactors-D-D and D-T reactions, Basic principles of Nuclear Fusion reactors

**UNIT – V**

**SMART MATERIALS and NANOMATERIALS**

- Shape Memory alloys (SMA): One way and two way Shape memory effect, pseudoelasticity, Properties and applications of SMA- features of Ni-Ti SMA alloy.
- Liquid Crystals : Types – nematic, cholesteric, smectic- Application to Display Devices
- Metallic Glasses: preparation by melt spinning. properties and applications
- Nanomaterials : Introduction to Nano materials–Methods of synthesis (CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nanomaterials.
- C_{60}-Buck Minster Fullerenes, carbon nanotubes- synthesis (Plasma arc, Pulsed Laser evaporation methods) Properties and applications.
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**Text Books:**

**Reference Books:**
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<th>Department</th>
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<tr>
<td>Chemistry</td>
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</table>

**Prerequisite:**

- To broaden the knowledge of environmental awareness and pollution
- To educate the importance of preserving the earth’s resources and ecosystem
- To highlight the modern techniques and regulations to monitor and control pollution

**Objectives:**

- Students will be able to understand about the environment and natural resources we are blessed with.
- Students will become aware of environmental issues like pollution, dwindling natural resources and degrading ecosystem.
- Students will be inspired to act as environmentally friendly and work for sustainable development of the humanity.

**Outcome:**

- Students will be able to understand about the environment and natural resources we are blessed with.
- Students will become aware of environmental issues like pollution, dwindling natural resources and degrading ecosystem.
- Students will be inspired to act as environmentally friendly and work for sustainable development of the humanity.

**UNIT – I  ECOSYSTEM AND BIODIVERSITY**


**UNIT – II  AIR POLLUTION**


**UNIT – III  WATER AND LAND POLLUTION**


**UNIT – IV  INSTRUMENTAL POLLUTION MONITORING**


**UNIT – V  ENERGY AND ENVIRONMENT**

Total contact Hours: 60  |  Total Tutorials: | Total Practical Classes: | Total Hours: 60
---|---|---|---

**Text Books:**

1. Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International (P) Ltd, New Delhi, 2009. (Unit I)
2. S.S. Dara, A Text Book of Environmental Chemistry and Pollution Control, S. Chand and Company Ltd, New Delhi, 2008. (Unit II, III, & V)

**Reference Books:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>BE102</td>
<td>Basic Electrical and Electronics Engineering</td>
<td>3 1 - 4</td>
<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To apply Kirchhoff’s law to simplify the given circuit.
- To understand the concept of AC circuit and to simplify the given RL, RC, RLC series and parallel circuits.
- To understand the principle of electromagnetic induction and the working principle of electrical machines.
- The students understand the working principle of transistor, FET, MOSFET, CMOS and their applications.
- To design adders, subtractors and to gain knowledge on sequential logic circuits.
- To understand the need for communication and acquire knowledge on different communication systems.
- To have an overview of different emerging technologies in day-to-day applications.

**Objectives:**
- The students explored the basic terminology, laws and concepts of DC and AC circuits in electrical engineering.
- The students know the principle of operation of DC and AC electrical machines and different types of power plants.
- Will understand the importance of FET’s, MOSFET’s, CMOS and their applications.
- Will be able to design Combinational and Sequential circuits.
- Awareness towards different Communication Systems.
- Gain knowledge in the working principle of real time applications used in day today life like ATM, Microwave Oven, Bluetooth, WiFi and Computer Networks.

**Outcome:**
- The students explored the basic terminology, laws and concepts of DC and AC circuits in electrical engineering.
- The students know the principle of operation of DC and AC electrical machines and different types of power plants.
- Will understand the importance of FET’s, MOSFET’s, CMOS and their applications.
- Will be able to design Combinational and Sequential circuits.
- Awareness towards different Communication Systems.
- Gain knowledge in the working principle of real time applications used in day today life like ATM, Microwave Oven, Bluetooth, WiFi and Computer Networks.

**UNIT – I**
**DC Circuits**


**UNIT – II**
**AC Circuits**

Concepts of AC circuits – rms value, average value, form and peak factors – Simple RL, RC and RLC series and parallel circuits – Concept of real and reactive power – Power factor – Series and parallel resonance - Introduction to three phase system - Power measurement by two wattmeter method.

**UNIT – III**
**Electrical Machines and Power Plants**

Law of Electromagnetic induction, Fleming’s Right & Left hand rule - Principle of DC rotating machine, Single phase transformer, single phase induction motor and synchronous motor (Qualitative approach only) - Layout of thermal, hydro and nuclear power generation (block diagram approach only). Components of AC transmission and distribution systems – One line diagram.

**UNIT – IV**
**Electronics**


**UNIT – V**
**Communication**

Need for Modulation – Block Diagram of Analog Communication System - AM, FM, PM Definitions &

UNIT – VI
Overview of Emerging Technologies
Microwave Ovens - RFID - Automated Teller Machines (ATM).

Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60

Text Books:

ELECTRICAL

ELECTRONICS AND COMMUNICATION

Reference Books:

ELECTRICAL

ELECTRONICS AND COMMUNICATION

Web sites:

1. www.electronics-tutorials.ws
2. www.en.wikipedia.org/wiki/Telecommunication
3. www.nptel.ac.in/courses/IIT-MADRAS/Basic_Electronics../LECTURE1.pdf
Department: Mechanical
Programme: B.Tech.
Semester: First/Second
Category: TA

<table>
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<tbody>
<tr>
<td>ME101</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
<td>4</td>
<td>40 60 100</td>
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</tbody>
</table>

Prerequisite: -

Objectives:
- To convey the basics of the thermodynamic principles
- To establish the relationship of these principles to thermal system behaviors
- To develop methodologies for predicting the system behavior
- To establish the importance of laws of thermodynamics applied to energy systems
- To explain the role of refrigeration and heat pump as energy systems
- To develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world.

Outcome:
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are made to understand the principles of thermodynamics and adjudge the viability of operation of any thermal system in real time applications
- Students are encouraged to make engineering judgments, to conduct independent exploration of topic of thermodynamics and to communicate the findings in a professional manner.
- Students are made to develop natural curiosity to explore the various facets of thermodynamic laws.
- While emphasizing basic laws, students are provided with modern tools to use in real time engineering problems.

UNIT – I

<table>
<thead>
<tr>
<th>Hours: 09</th>
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</table>

UNIT – II

<table>
<thead>
<tr>
<th>Hours: 09</th>
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</thead>
<tbody>
<tr>
<td>The concept of energy, work and heat – reversible work- internal energy -Perfect gas – specific heats – Joules law - enthalpy- Conservation of Energy principle for closed and open systems - First law of thermodynamics – Application of first law to a process (flow and non-flow) – Steady flow energy equation and its engineering application - Calculation of work and heat for different processes.</td>
</tr>
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UNIT – III

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<tr>
<th>Hours: 09</th>
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UNIT – IV

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<th>Hours: 09</th>
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UNIT – V

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<th>Hours: 09</th>
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</thead>
<tbody>
<tr>
<td>Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system – Liquefaction – Solidification (only theory).</td>
</tr>
</tbody>
</table>

Total contact Hours: 45  | Total Tutorials: 15 | Total Practical Classes:  | Total Hours: 60 |
Text Books:


Reference Books:


Web sites:

1. http://nptel.iitm.ac.in/courses/Webcourse-contents/
### Course Information

**Department:** Computer Science and Engineering/Information Technology  
**Programme:** B.Tech.  
**Semester:** First / Second  
**Category:** TA

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<th>P</th>
<th>C</th>
<th>CA</th>
<th>SE</th>
<th>TM</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>CS101</td>
<td>COMPUTER PROGRAMMING</td>
<td>3</td>
<td>1</td>
<td>-</td>
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<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>100</td>
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</tbody>
</table>

#### Prerequisite:
- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.

#### Objectives:
- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.

#### Outcome:
On successful completion of the course, students will be able to:
- Understand the basics of computers and its related components
- Have the ability to write a computer program to solve specified problems

### UNIT – I

**Hours: 09**


### UNIT – II

**Hours: 09**


### UNIT – III

**Hours: 09**

Strings – String I/O functions, String Library functions – Storage classes.

### UNIT – IV

**Hours: 09**


### UNIT – V

**Hours: 09**

Dynamic Memory Allocation: MALLOC, CALLOC, FREE, REALLOC.  
Introduction to preprocessor – Macro substitution directives – File inclusion directives – Compiler Control directives – Miscellaneous directives.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

### Text Books:

### Reference Books:
**Course Code** | **Course Name** | **Hours / Week** | **Credit** | **Maximum Marks**
--- | --- | --- | --- | ---
ME102 | Engineering Graphics | L | T | P | C | CA | SE | TM
--- | --- | --- | --- | --- | --- | --- | --- | ---
2 | 3 | 4 | 50 | 50 | 100

**Objectives:**
- To convey the basics of engineering drawing
- To explain the importance of an engineering drawing
- To teach different methods of making the drawing
- To establish the importance of projects and developments made in drawing that are used in real systems

**Outcome:**
- From what students have already learnt and know, relation has been brought about how to bring their vision into realities.
- Students are made to follow and understand the basic of mechanical drawing
- Students are encouraged to make engineering drawing of physical object representing engineering systems.
- Students are made to develop natural curiosity to explore the various facets of engineering drawings.

**UNIT – 0**
Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning.

**UNIT – I**
Projection of Points and Projection of lines

**UNIT – II**
Projection of Planes and Projections of solids in simple positions

**UNIT – III**
Projection of solids in complicated positions

**UNIT – IV**
Sections of solids - Development of Surfaces

**UNIT – V**
Axonometric Projections: Isometric Projections (simple solids); Perspective Projections (planes and simple solids; Orthographic Projections

**Text Books:**
3. BIS, Engineering Drawing practices for Schools & College, SP 46 : 2003

**Reference Books:**
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int.,

**Web sites:**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>CS102</td>
<td>Computer Programming Laboratory</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To study and understand the use of OS commands
- To get familiarity on MS-Office packages like MS-Word, MS-Excel and MS-Powerpoint
- To gain a hands on experience of compilation and execution of ‘C’ programs
- To inculcate logical and practical thinking towards problem solving using C programming.

**Objectives:**
- On successful completion of the course, students will be able to:
  - Have the ability to write a computer program to solve specified problems
  - Problem solving ability will be gained by the students

**Outcome:**

**Cycle – I Fundamentals of Computing**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Study of OS commands</td>
</tr>
<tr>
<td>2.</td>
<td>Use of mail merge in word processor</td>
</tr>
<tr>
<td>3.</td>
<td>Use of spreadsheet to create Charts (XY, Bar, Pie) with necessary formulae.</td>
</tr>
<tr>
<td>4.</td>
<td>Use of Power point to prepare a slide show.</td>
</tr>
</tbody>
</table>

**Hours: 09**

**Cycle – II Programming Using C**

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Study of Compilation and execution of simple C programs</td>
</tr>
<tr>
<td>2.</td>
<td>Basic C Programs</td>
</tr>
<tr>
<td>3.</td>
<td>Programs using Branching statements</td>
</tr>
<tr>
<td>4.</td>
<td>Programs using Control Structures</td>
</tr>
<tr>
<td>5.</td>
<td>Programs using String Operations</td>
</tr>
<tr>
<td>6.</td>
<td>Programs using Arrays</td>
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<tr>
<td>7.</td>
<td>Programs using Functions</td>
</tr>
<tr>
<td>8.</td>
<td>Programs using Structure</td>
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**Hours: 36**
<table>
<thead>
<tr>
<th>a. Student Information System</th>
<th>b. Employee Pay Slip Generation</th>
<th>c. Electricity Bill Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Programs using Pointers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Pointer and Array</td>
<td>b. Pointer to function</td>
<td>c. Pointer to Structure</td>
</tr>
<tr>
<td>10. Programs using File Operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Counting No. of Lines, Characters and Black Spaces</td>
<td>b. Content copy from one file to another</td>
<td>c. Reading and Writing Data in File</td>
</tr>
</tbody>
</table>

| Total contact Hours: - | Total Tutorials: - | Total Practical Classes: 45 | Total Hours: 45 |
### Course Details

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<tr>
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<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
<tr>
<td>BE103</td>
<td>Basic Electrical and Electronics Engineering Laboratory</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Prerequisites:
- To understand the basic electrical tools and their applications.
- To get trained in using different types of wiring.
- To find faults in electrical lamp and ceiling fan.
- To understand and apply Kirchhoff’s laws to analyze electrical circuits.
- To study the operation of CRO and principle of fiber optic communication.
- To design adder and subtractors.
- To understand the frequency response of RC coupled amplifier.

#### Objectives:
- The students get exposure on the basic electrical tools, applications and precautions.
- The students are trained for using different types of wiring for various purposes in domestic and industries.
- The students are taught to find faults in electrical lamp and ceiling fan.
- Will be able to learn and use equipments like Signal Generator, Power Supply and CRO.
- To apply Kirchhoff’s law for simplification of circuits.
- To design combinational circuits.
- To obtain the frequency response of Amplifiers.

#### Outcome:
- The students are taught to find faults in electrical lamp and ceiling fan.
- Will be able to learn and use equipments like Signal Generator, Power Supply and CRO.
- To apply Kirchhoff’s law for simplification of circuits.
- To design combinational circuits.
- To obtain the frequency response of Amplifiers.

#### List of Experiments

#### Electrical Lab
1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor’s room wiring.
7. Go down wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses and A.C. and D.C. meters.

#### Electronics and Communication Lab
1. Study of Kirchoff’s Laws.
2. Study of Fiber Optic Communication.
4. Zener Diode as Voltage Regulator.
5. Design of Adder and Subtractor Circuits.

Total contact Hours: 45 | Total Tutorials: - | Total Practical Classes: 45 | Total Hours: 45
<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>MA103</td>
<td>MATHEMATICS III</td>
<td>3</td>
<td>1</td>
<td>4</td>
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</table>

**Prerequisite:**
- To introduce the ideas of Laplace and Fourier Transforms

**Objectives:**
- To introduce Laplace and Fourier Transforms
- To familiarize students with Complex Analysis
- To introduce Fourier series

**Outcome:**
- Understands Transform Calculus
- Understand Complex Analysis
- Able to apply Fourier series

**UNIT – I**
**Laplace Transform**
**Hours:** 9


**UNIT – II**
**Complex Variable- Analytic Functions**
**Hours:** 9

Continuity, derivative and analytic functions – Necessary conditions Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions. Conformal mapping – Simple and standard transformations like \( w = z+c, cz, \frac{1}{z}, e^{iz}, \sin\frac{1}{z} \) Bilinear transformation. (Excluding Schwarz-Christoffel transformation)

**UNIT – III**
**Complex Integration**
**Hours:** 9

Complex integration, Cauchy’s Integral theorem Cauchy’s integral formula and problems Taylor’s and Laurent’s theorem (without proof) Series expansion of complex valued functions classification of singularities.. Residues and evaluation of residues – Cauchy’s residue theorem – Contour integration: Cauchy’s and Jordan’s Lemma (statement only) Application of residue theorem to evaluate real integrals – unit circle and semicircular contour (excluding poles on boundaries).

**UNIT – IV**
**Fourier Series**
**Hours:** 9


**UNIT – V**
**Fourier Transform**
**Hours:** 9

Fourier integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, convolution and Parseval’s identity.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:**  
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
-
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<td>CS146</td>
<td>DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING</td>
<td>3 1 - 4</td>
<td>40 60 100</td>
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</table>

**Prerequisite:**
- To acquaint students with data structures using C when programming for the storage and manipulation of data
- To emphasize the concept of data abstraction and the problem of building implementations of abstract data types
- To make understand the concepts of object oriented programming and to expertise the programming skills through C++ language.

**Objectives:**
- On successful completion of the course, the students will be able to address the issues in storage and manipulation of data
- They can prepare object-oriented design for small/medium scale problems, to write a computer program for specific problems.

**Outcome:**

**UNIT – I**

**UNIT – II**

**UNIT – III**

**UNIT – IV**

**UNIT – V**

**Text Books:**

**Reference Books:**
<table>
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<tr>
<th>Department : EEE</th>
<th>Programme : B.TECH</th>
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<td>Semester : THIRD</td>
<td>Category : TA</td>
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<th>Hours / Week</th>
<th>Credit</th>
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<tr>
<td>EE101</td>
<td>ELECTRIC CIRCUIT ANALYSIS</td>
<td>3</td>
<td>L 1 T 4</td>
<td>CA 40 SE 60 TM 100</td>
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</table>

**Prerequisite:** Laplace Transform

**Objectives:**
- To introduce fundamental principles of circuit theory which makes them familiar in applying circuit theorems to simplify and find solutions to electrical circuits
- To introduce the fundamentals of graph theory such as incidence matrix, reduced incidence matrix, tie set and cut set matrix
- To make them understand about the transient response of RL, RC and RLC circuits to DC and AC excitation, resonance and coupled circuits are analyzed.

**Outcome:**
- By the end of this course, the student will be able to have a good understanding of the basics of circuit theory and acquire engineering analytic techniques and skills.
- The students can apply the knowledge of network theorems and circuit analysis of both AC and DC circuits, network topology, transient analysis and resonance for solving real world electrical circuit design.

**UNIT – I** Circuit Analysis and Network Theorems for DC Circuits

- Review - Loop and Nodal method for DC circuits. Theorems -Thevenin’s, Norton’s, Superposition, Compensations - Tellegen’s, Reciprocity, Maximum power transfer theorems - Millman’s theorem – Applications to DC circuits.

**UNIT – II** Circuit Analysis and Network Theorems for AC Circuits


**UNIT – III** Three Phase Circuits and Network Topology

- Three phase circuits: Three phase balanced/unbalanced voltage sources–analysis of three phase 3-wire and 4-wire circuits with star and delta connected balanced & unbalanced loads. Basic concepts of graph theory: Graph-directed graph-branch chord-Tree for two port networks, incidence and reduced incidence matrices-application to network solutions. Link current and tie set, tree branch voltage and cut set, duality and dual networks.

**UNIT – IV** Transient Analysis of First & Second Order Circuits

- Transient response of RL, RC and RLC circuits to DC and AC excitation - Natural and forced oscillations - Laplace transform application to transient conditions.

**UNIT – V** Resonance and Coupled Circuits


**Total contact Hours: 45**
**Total Tutorials: 15**
**Total Practical Classes:**
**Total Hours: 60**

**Text Books:**

**Reference Books:**

**Websites:**
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<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE102</td>
<td>ELECTRICAL MACHINES – I</td>
<td>3</td>
<td>1</td>
<td>4</td>
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</table>

Prerequisite:
- To make an engineering student to understand and evaluate the performance of power and distribution transformers
- To emphasize the basic concepts of electromechanical energy conservation through energy and co-energy
- To make them learn the working of energy conversion machines namely motor and generator and various methods to control its speed

Objectives:
- The graduates will be having the knowledge of construction and operation of DC machines and transformers
- Graduates can determine the performance of DC machines and transformers from the predetermined and determined test data.

Outcome:
- The graduates will be having the knowledge of construction and operation of DC machines and transformers
- Graduates can determine the performance of DC machines and transformers from the predetermined and determined test data.

UNIT – I          Magnetic Circuits and Electro Mechanical Energy Conversion          Hours: 9

Simple magnetic circuit calculations – B-H Relationship – Magnetically induced emf and force – AC operation of magnetic circuits – Hysteresis and Eddy current losses - Energy in magnetic system – Field energy and mechanical force – Energy conversion via electric field

UNIT – II              DC Generator              Hours: 9

Elementary concepts of rotating machines – mmf of distributed winding - DC Generator- Construction – Lap and wave winding – emf equation-excitation and types of generators- Characteristics - armature reaction-methods of improving commutation-testing power flow diagram-Applications

UNIT – III              DC Motor              Hours: 9

DC Motor-torque equation – types-back emf and voltage equations-characteristics- Starting-Speed control-testing-direct, indirect and regenerative tests-Power flow and efficiency- separation of losses-retardation test-Braking - DC machines dynamics – Applications

UNIT – IV              Transformers             Hours: 9

Single phase transformers – Principle-Construction – No load operation – Ideal transformer-Vector diagram- no load and on load -Equivalent circuit – Parallel operation and load sharing of single-phase transformers – Testing – Losses — Efficiency, voltage regulation and all day efficiency-Applications

UNIT – V              Polyphase Transformers and Special Transformers            Hours: 9


Total contact Hours: 45  Total Tutorials: 15  Total Practical Classes:  60  Total Hours: 60

Text Books:

Reference Books:

Websites:
**Department**: EEE  
**Programme**: B.TECH

<table>
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<th>Course Code</th>
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<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE103</td>
<td>ELECTRONIC DEVICES AND CIRCUITS</td>
<td>4</td>
<td>4</td>
<td>40 60 100</td>
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</table>

**Prerequisite**: 
- The course on aims to introduce various electronic devices like diodes, transistors, FET, MOSFET, DIAC and TRIAC
- The students will be introduced to basic applications like rectifier circuits, filters, voltage regulator and amplifier circuits
- The course aims to provide the fundamental concepts of electronics to students and prepares them comprehensively for electronic circuit analysis to be dealt in future.

**Objectives**: 
- Students will be having the knowledge of diodes, transistors, FET and other power devices
- They will demonstrate the ability to design analog circuits for any real world electronic circuit application.

**Outcome**: 

---

**UNIT – I**  
**Semiconductor Theory and PN Diodes**: Hours: 12  
Introduction to Semiconductor materials– atomic theory– energy band structure of insulators, conductors and semiconductors– intrinsic and extrinsic semiconductors– N-type and P-type semiconductors.  
**SEMICONDUCTOR DIODES**:  

**UNIT – II**  
**Bipolar Junction Transistors**: Hours: 12  
Construction and operation– NPN and PNP transistors– CB, CE and CC configurations– Transistor characteristics and regions of operation– Specification sheet– Biasing of BJTs– operating point– stabilization of operating point– different biasing circuits and DC load-line characteristics – Bias compensation techniques– thermal stability and thermal runaway.

**UNIT – III**  
**Field Effect Transistors**: Hours: 12  
Construction – Drain and transfer characteristics – Shockley’s equation– comparison between JFET and BJT – MOSFET – depletion type and enhancement types – Biasing of FETs – biasing circuits.

**UNIT – IV**  
**Power Devices**: Hours: 12  

**UNIT – V**  
**Special Two-Terminal Devices**: Hours: 12  
Principle of operation of Schottky diode, Varactor diode, Zener diode, Tunnel diode and PIN Diodes.  
**OPTO ELECTRONIC DEVICES**: Principle of operation and characteristics of Photo diodes, Phototransistors, Photo conductive cells, LEDs and LCDs, Opto-couplers, Solar cells and thermistors.

**Total contact Hours**: 60  
**Total Tutorials**: 60  
**Total Practical Classes**: 60  
**Total Hours**: 60

**Text Books**:

**Reference Books**:
### Course Information

**Department:** EEE  
**Programme:** B.TECH  
**Semester:** THIRD  
**Category:** TA

<table>
<thead>
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<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE104</td>
<td>ELECTROMAGNETIC THEORY</td>
<td>3 L 1 T 4 C</td>
<td>40 CA 60 SE 100 TM</td>
<td></td>
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</tbody>
</table>

**Prerequisite:** Mathematics –II

**Objectives:**
- To look back the mathematical tools like coordinate systems and vector calculus to investigate the physics of electric and magnetic fields
- To demonstrate the unification of electrostatic and magneto-static fields as a time varying electromagnetic fields that lead to the development of Maxwell’s equations and explores the fundamental of wave propagation in different mediums
- It also introduces students the applications of time varying field and wave propagation and thereby makes them competent in electric, magnetic and time varying fields

**Outcome:**
- Graduates can demonstrate an ability to identify, formulate and solve electromagnetic field problems and design capacitors, inductors, dielectric circuits for cables and magnetic circuits for transformer and electrical machines

### UNIT – I

**Electrostatic Field**  
**Hours:** 9

- Introduction - Coulomb’s law – Electric field intensity–electric fields due to point, line, surface and volume charge distributions – Electric flux density–Gauss law –Applications of Gauss ‘Law–Divergence – Maxwell’s first equation

### UNIT – II

**Electric Fields in Material Space**  
**Hours:** 9


### UNIT – III

**Steady Magnetic Fields**  
**Hours:** 9


### UNIT – IV

**Magnetic Materials, Concepts and Applications**  
**Hours:** 9


### UNIT – V

**Electromagnetic Wave Propagation**  
**Hours:** 9


**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:**  
**Total Hours:** 60

**Text Books:**


**Reference Books:**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE105</td>
<td>ELECTRICAL MACHINES LAB –I</td>
<td>-</td>
<td>3</td>
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</table>

Prerequisite: -

Objectives:
- The objective of the course is to enable the students to realize the performance of single phase and three phase transformers under no load and load conditions.
- It enables the students to understand the intricacies in connecting the circuit and conducting the experiments.
- The students get familiarize with the load performance of different types of DC motors and generators and understand the predetermination methods for finding the losses and efficiencies of transformers and DC motors.

Outcome:
- At the end of the course, students get familiarize with the performance of different types of DC motors and generators.
- They understand the predetermination methods for finding the losses and efficiencies of transformers and DC machines.

**DC Machines**
1. Load test on DC shunt Motor
2. Load test on DC series Motor
3. Load test on DC Compound Motor
4. Open Circuit Characteristics of self-excited DC shunt Generator
5. Load test on self-excited DC shunt Generator
6. Open Circuit Characteristics of separately excited DC shunt Generator
7. Load test on separately excited DC shunt Generator
8. Load test on DC series Generator
9. Swinburne’s Test
10. Hopkinson’s test on DC Machines
11. Study on Retardation test and Speed control of DC Motors

**TRANSFORMERS**
1. Load test on single phase transformer
2. O.C and S.C test on single phase transformer
3. Load test on three phase transformer
4. Parallel operation of single phase & three phase transformers
5. Sumpner’s test on single phase transformers
6. Study of three phase transformer connections

Total contact Hours: -
Total Tutorials: -
Total Practical Classes: 45
Total Hours: 45
<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
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<tr>
<td>CS147</td>
<td>DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING LAB</td>
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</tbody>
</table>

**Prerequisite:**
- To give hands on training on data storage and data manipulation.
- The course enables the students to develop their own codes, skills in debugging, testing and finally validating the programs

**Objectives:**
- On successful completion of the course, the students excel in writing codes in C and C++, build their own user defined packages, interface, and develop single and multi-threaded applications.

**Outcome:**
- Searching Techniques
- Sorting Techniques
- Imp Linked List and doubly linked and its applications
- Stack and its applications
- Implement Queue and its applications
- Binary tree traversal
- Graph traversal
- Shortest path algorithms
- Programs to implement classes and objects with constructors and destructors
- Programs to implement different types of inheritances like multiple, Multilevel and hybrid
- Programs to implement virtual functions to demonstrate the use of run time polymorphism
- Programs to implement Exception handling

**List of Experiments**

<table>
<thead>
<tr>
<th>List of Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Searching Techniques</td>
</tr>
<tr>
<td>2. Sorting Techniques</td>
</tr>
<tr>
<td>3. Imp Linked List and doubly linked and its applications</td>
</tr>
<tr>
<td>4. Stack and its applications</td>
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<tr>
<td>5. Implement Queue and its applications</td>
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<tr>
<td>6. Binary tree traversal</td>
</tr>
<tr>
<td>7. Graph traversal</td>
</tr>
<tr>
<td>8. Shortest path algorithms</td>
</tr>
<tr>
<td>9. Programs to implement classes and objects with constructors and destructors</td>
</tr>
<tr>
<td>10. Programs to implement different types of inheritances like multiple, Multilevel and hybrid</td>
</tr>
<tr>
<td>11. Programs to implement virtual functions to demonstrate the use of run time polymorphism</td>
</tr>
<tr>
<td>12. Programs to implement Exception handling</td>
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**Total Contact Hours:** - | **Total Tutorials:** - | **Total Practical Classes:** 45 | **Total Hours:** 45
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<tr>
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<tr>
<td>MA105</td>
<td>MATHEMATICS IV</td>
<td>3 1 -</td>
<td>4</td>
<td>40 60 100</td>
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</tbody>
</table>

**Prerequisite:**
- To introduce the ideas of Partial Differential Equations
- To familiarize students Boundary value problems related to PDE
- To introduce methods Statistical oriented Sampling techniques

**Objectives:**
- Understands PDE
- Gain knowledge on Boundary value problem
- Able to apply Sampling techniques

**Outcome:**
- To introduce the ideas of Partial Differential Equations
- To familiarize students Boundary value problems related to PDE
- To introduce methods Statistical oriented Sampling techniques

**UNIT – I**  
Partial Differential Equations  
Hours: 9

**UNIT – II**  
Boundary Value Problems  
Hours: 9
Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solutions – Transverse vibration of anelastic string

**UNIT – III**  
Heat Equations  
Hours: 9
Fourier series solution for one dimensional heat flow equation – Fourier series solutions for two dimensional heat flow equations under steady state conditions (Cartesian and polar forms).

**UNIT – IV**  
Applied Statistics –I  
Hours: 9
Curve fitting by the method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

**UNIT – V**  
Applied Statistics-II  
Hours: 9
Small samples: Test for single mean, difference of means and correlation coefficients – test for ratio of variances – Chi–Square test for goodness of fit and independence of attributes.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:**  
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
-
**Department: EEE**
**Programme: B.TECH**

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<td>EE106</td>
<td>LINEAR CONTROL SYSTEMS</td>
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**Prerequisite:**
- To introduce a comprehensive treatment of various facts, modeling, analysis and control of linear dynamic systems
- To introduce two modeling approaches namely the transfer function and state space approach
- To deal with methodologies for ascertaining various attributes of dynamic systems like controllability, observability and stability.

**Objectives:**
- The students will be able to analyze the stability of systems using classical techniques like Routh-Hurwitz test, Bode plots and Nyquist techniques
- At the end of the course, the students will be able to analyze, model and design controllers for linear dynamic systems.

**Outcome:**
- **UNIT – I**
  - Introduction to Control systems – Classical control theory concepts–Mathematical modeling of physical systems–transfer function approach – concept of poles and zeros – Open and closed loop control systems – Simplification of complex systems using block diagram reduction technique and Mason’s gain formula (signal flow graphs).
  - Hours: 9

- **UNIT – II**
  - Time-Response Analysis
  - Hours: 9

- **UNIT – III**
  - Frequency Response Analysis
  - Hours: 9

- **UNIT – IV**
  - Stability of Dynamic Systems
  - Hours: 9

- **UNIT – V**
  - State-Space Analysis and Dynamic Systems
  - Introduction to state-variable approach to modeling of dynamic systems–physical variable, phase variable and canonical variable approaches–advantages of state variable approach over transfer function–derivation of transfer function from state space model- Solution to state equation–homogenous system and forced system–state transition matrix and its properties– ascertaining stability from eigen values of system matrix–Introduction to controllability and observability concepts.
  - Hours: 9

**Total contact Hours: 45**
**Total Tutorials: 15**
**Total Practical Classes: 10**
**Total Hours: 60**

**Text Books:**

**Reference Books:**


Websites:

NPTEL video lecture http://nptel.ac.in/courses/108102043/
Department : EEE          Programme : B.TECH
Semester : FOURTH          Category : TA

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<td>EE107</td>
<td>ELECTRICAL MACHINES- II</td>
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Prerequisite: Electric Circuits & Magnetic Circuits

Objectives:
- To provide a complete understanding of the principle and performance of three phase induction motor with evaluation of its characteristics and numerous applications
- To give a detailed exposure on three phase synchronous machine, operation, principle, working nature both as generator and as motor
- Besides, the course includes study of single phase machines with some special machines and their characteristics and specific applications.

Outcome:
- On completion of the course, the students will be able to understand the characteristics of different ac machines and their operation
- They can predetermine or determine the performance of induction machines and synchronous machines in the industrial environment.

UNIT – I
Three Phase Induction Motor
AC windings – Establishment of magnetic poles – Rotating magnetic field - Three phase induction motor – Construction, types and operation – Torque equation – Mechanical characteristics effect of supply voltage and rotor resistance on torque, - Tests- derivation of exact equivalent circuit.

UNIT – II
Induction Motor Starting and Speed Control

UNIT – III
Synchronous Generator
Types, construction and principle of operation - EMF equation- winding factor , effect of chording and winding distribution – armature reaction – Voltage regulation by synchronous impedance, MMF and Potier triangle methods - load characteristics – Parallel operation of synchronous generators, Synchronizing to infinite bus-bars- power transfer equations, capability curve- two reaction model of salient pole synchronous machines and power angle characteristics - determination of Xd&Xq by slip test- Short circuit transients in synchronous machines.

UNIT – IV
Synchronous Motor

UNIT – V
Single Phase and Special Machines

Total contact Hours: 45          Total Tutorials: 15          Total Practical Classes:          Total Hours: 60

Text Books:
2. B.L. Theraja, Electrical Technology Vol.II AC/DC Machines, S. Chand, 2008

Reference Books:
**Department**: EEE  
**Programme**: B.TECH  
**Semester**: FOURTH  
**Category**: TA

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<td>EE108</td>
<td>ELECTRONIC CIRCUITS</td>
<td>3 1 -</td>
<td>4</td>
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</table>

**Prerequisite:**  
Electron Devices

**Objectives:**
- To provide the students a complete understanding of transistor circuits and low frequency amplifiers
- To make them understand modeling of bi-polar junction transistor and field effect transistors
- The course includes detailed analysis and design of amplifiers, multistage amplifiers, oscillators using BJT and FET and of power amplifiers.

**Outcome:**
- At the end of the course students will be capable of analyzing and designing electronic circuits using BJT and FET for industrial applications.

**UNIT – I**  
Small Signal Amplifiers  
**Hours**: 9


**UNIT – II**  
Multistage Amplifiers  
**Hours**: 9


**UNIT – III**  
Large Signal Amplifiers  
**Hours**: 9

Classification of Power amplifiers–Class A power amplifier–direct coupled and transformer coupled–Class B amplifier–push-pull arrangement and complementary symmetry amplifiers–Conversion efficiency calculations–cross-over distortion–Class AB amplifier–Amplifier distortion – Power transistor heat sinking – Class C and Class D amplifiers.

**UNIT – IV**  
Feedback Amplifiers  
**Hours**: 9

Feedback concept–Gain with feedback–General characteristics of negative feedback amplifiers–Four basic types of feedback and the effect on gain, input and output resistances. Multistage feedback amplifiers–Two stage CE amplifier with series voltage negative feedback – frequency response and stability.

**UNIT – V**  
Oscillators  
**Hours**: 9


**Total contact Hours**: 45  
**Total Tutorials**: 15  
**Total Practical Classes**:  
**Total Hours**: 60

**Text Books:**

**Reference Books:**

**Websites:**
Reference Books:


Text Books:

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**Course Code**: EE110  
**Course Name**: ELECTRICAL MACHINES LAB-II

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<td>ELECTRICAL MACHINES LAB-II</td>
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</table>

**Prerequisite**: -

**Objectives**:  
- The objective of the course is to enable the students to realize the performance of AC generators under no load and load conditions.
- The students get familiarize with the load performance of different types of induction motors and synchronous motors.

**Outcome**:  
- The course enables the students to understand the predetermination methods for finding the losses and efficiencies of AC motors and generators.

**LIST OF EXPERIMENTS**

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

**SYNCHRONOUS MACHINES**
8. Load test on 1-phase Alternator  
9. Load test on 3-phase Alternator  
11. Synchronization of 3-phase Alternator with bus bars  
12. V and inverted V curve of an auto synchronous motor  
13. Determination direct axis reactance and quadrature axis reactance of a salient pole alternator by slip test.  
14. Performance Characteristics of Universal Motor

**Total contact Hours**: -  
**Total Tutorials**: -  
**Total Practical Classes**: 45  
**Total Hours**: 45

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Department: EEE
Programme: B.Tech.
Semester: FOURTH
Category: LB

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<td>EE111</td>
<td>ELECTRONICS LAB – I</td>
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Prerequisite: -

Objectives:
- To enable the students to understand the volt-ampere characteristics of basic electron devices such as PN junction diode, zener diode, bipolar junction transistor, field effect transistor, and silicon controlled rectifier.

Outcome:
- The students acquire knowledge about the design of biasing circuits of BJT and FET in order to apply them for realizing any electronic circuits
- In addition, the students are introduced with some of the applications of these electron devices

**LIST OF EXPERIMENTS**

1. Determination of V-I characteristics of PN Junction diode and Zener diode.
2. Determination of input and output characteristics of a BJT in CE configuration.
3. Determination of input and output characteristics of a BJT in CB configuration.
4. Determination of drain and trans-conductance of a FET.
5. Determination of intrinsic stand-off ratio of an UJT.
6. Determination of switching characteristics of a SCR.
7. Determination of switching characteristics of a TRIAC in forward and reverse modes.
8. Design of diode clippers and clamping diodes.
9. Study of half wave and full wave rectifiers with and without filters.
10. Design of series and shunt regulators using Zener diodes.
11. Study and design of various transistor biasing circuits.
12. Study of operation of a CRO.
13. Study of operation of DSO

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: 45  Total Hours: 45
### Department: EEE  
### Programme: B.TECH

### Semester: FIFTH  
### Category: TB

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<td>EE112</td>
<td>MEASUREMENTS AND INSTRUMENTATION</td>
<td>3 L 1 T -</td>
<td>4 C 40 CA 60 SE 100 TM</td>
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#### Prerequisite:

- The objective of the course is to understand the basics of measurement and instrumentation and to acquire knowledge about calibration, and different types of electrical instruments
- Also the course introduces the working principle of various bridges and magnetic measurements
- The course facilitates the students to analyze the concepts of display devices and to be aware of transducers.

#### Objectives:

- At the end of the course, students will be familiar with a class of measuring instruments which will enable the students to identify and choose appropriate instruments for specific applications.

#### Unit – I

Introduction to Measurement  
Hours: 9

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

#### Unit – II

Electrical Measuring Instruments  
Hours: 9


#### Unit – III

AC Measurement & Magnetic Measurements  
Hours: 9


#### Unit – IV

Display and Recording Devices  
Hours: 9

LED & LCD Display Dot Matrix Display, 7 Segment Display Strip Chart Recorders Single point and multipoint Recorders–X-Y Recorders-Magnetic Tape Recorders-Data Loggers– Electromagnetic and Electrostatic interference-Data Acquisition system.

#### Unit – V

Transducers  
Hours: 9

Temperature transducers-RTD, thermistor, Thermocouple-Displacement transducer-Inductive, capacitive, LVDT, Pressure transducer–Bourdon tube, Bellows–Flow transducer– Electromagnetic flow meter – Strain gauges–Piezoelectric and Hall Effect transducer

| Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total contact Hours: 45 |

#### Text Books:


#### Reference Books:


**Department:** EEE  
**Programme:** B.TECH  
**Semester:** FIFTH  
**Category:** TA

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<td>EE113</td>
<td>TRANSMISSION AND DISTRIBUTION</td>
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</table>

**Prerequisite:** Electric Circuit Analysis

**Objectives:**  
- To make the students to understand the structure of electric supply system and different types of distribution systems  
- To gain the knowledge of line parameters, skin effect, proximity effect and corona in transmission lines  
- To study on the selection of cables and insulators for specific applications and the design aspects of rural and town electrification schemes, HVDC and FACTS technology.

**Outcome:**  
- The graduates will be able to design transmission and distribution systems for the requirements and can predetermine or determine the performance of both transmission and distribution networks.

<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>Distribution Systems</th>
<th>Hours: 9</th>
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</thead>
<tbody>
<tr>
<td>Structure of electric power systems-one Line Diagram-generation, transmission and distribution Systems-comparison of distribution systems—radial and ring –two wire dc, ac single phase and three phase systems—current and voltage calculations in distributors with concentrated and Distributed loads – Kelvin’s law for the design of feeders and its limitations.</td>
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<table>
<thead>
<tr>
<th>UNIT – II</th>
<th>Transmission Line Parameters</th>
<th>Hours: 9</th>
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</thead>
<tbody>
<tr>
<td>Resistance, inductance and capacitance of single and three phase transmission lines-symmetrical and unsymmetrical spacing—transposition-single and double circuits-stranded and bundled conductors-application of self and mutual GMD–Skin and Proximity effect-inductive interference–Corona-characteristics.</td>
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<thead>
<tr>
<th>UNIT – III</th>
<th>Performance of Transmission Lines</th>
<th>Hours: 9</th>
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<tbody>
<tr>
<td>Development of equivalent circuits for short, medium and long lines—efficiency and regulation-Attenuation constant and phase constant- surge impedance loading –power circle diagrams for sending and receiving end-transmission capacity, steady state stability limit–voltage control of lines-shunt and series compensation.</td>
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<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>Insulators and Cables</th>
<th>Hours: 9</th>
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<table>
<thead>
<tr>
<th>UNIT – V</th>
<th>Recent Trends in Transmission</th>
<th>Hours: 9</th>
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| Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total Hours: 60 |

**Text Books:**


**Reference Books:**


**Websites:**
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<th>Department</th>
<th>EEE</th>
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<td>Programme</td>
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<td>Semester</td>
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<tr>
<td>EE114</td>
<td>ANALOG AND DIGITAL INTEGRATED CIRCUITS</td>
<td>3 L 1 T 1 P</td>
<td>4 C</td>
<td>40 CA 60 SE 100 TM</td>
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</tbody>
</table>

**Prerequisite:**
- To introduce basic fabrication method of integrated circuits, features of various digital IC families, the characteristics of op-amps and the method of analysis and design of various circuits using op-amps
- The course also aims to teach the design of electronic circuits using PLL and timers.

**Objectives:**
- The students will be capable to formulate, analyze and design analog and digital circuits using op-amps, timers and PLL for real time applications.

**UNIT – I**
IC Fabrication and Logic Families
Hours: 9
Monolithic IC technology- planar process- Bipolar junction transistor– FET fabrication – CMOS technology. DIGITAL IC’s. Logic families; DTL, HTL, RTL, TTL, ECL, PMOS, CMOS, I²L performance criteria -Comparison, applications, advantages.

**UNIT – II**
Operational Amplifiers
Hours: 9
Introduction to Linear ICs- BJT differential amplifier-Operational amplifier IC 741– Block diagram and Characteristics - Inverting, non-inverting and difference amplifier – Adder, Subtractor, Integrator, Differentiator- Comparator- Window detector- Regenerative comparator (Schmitt trigger) - Precision rectifier- Current to voltage converter – Voltage to current converter-Log and antilog amplifiers- Instrumentation amplifiers.

**UNIT – III**
Analog IC Applications
Hours: 9

**UNIT – IV**
Active Filters and Waveform Generator
Hours: 9
First and second order Active filters-Low pass, highpass, bandpass and band reject filters-State variable filter-Switched capacitor filter–Waveform generator-RC Phase shift and Wien-bridge oscillators – Multivibrators– triangular and sawtooth wave generator.

**UNIT – V**
Phase Locked Loop and Timer
Hours: 9

**Total contact Hours:** 45  **Total Tutorials:** 15  **Total Practical Classes:**  **Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
Department: EEE  
Programme: B.TECH
Semester: FIFTH  
Category: TA

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<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE115</td>
<td>ELECTRICAL MACHINE DESIGN</td>
<td>3 1 -</td>
<td>4</td>
<td>40 60 100</td>
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</tbody>
</table>

Prerequisite:
- To Understand basics of design considerations for rotating and static electrical machines
- To Design the single phase and three phase transformers
- To Design rotating DC electrical machines
- To Design rotating AC electrical machines

Objectives:
- The students will be able to know the design aspects of electrical machines
- Studies carried out by the students will reveal to design enhanced efficient electrical machines.

Outcome:
- To Design rotating AC electrical machines
- To Design rotating DC electrical machines
- To Design the single phase and three phase transformers
- To Understand basics of design considerations for rotating and static electrical machines

UNIT – I  
Introduction  
Hours: 9

UNIT – II  
Design of Transformers  
Hours: 9

UNIT – III  
Design of DC Machines  
Hours: 9

UNIT – IV  
Design of Three Phase Induction Motor  
Hours: 9

UNIT – V  
Design of Synchronous Machines  
Hours: 9

Total contact Hours: 45  
Total Tutorials:15  
Total Practical Classes:  
Total Hours:60

Text Books:
2. V.N.Mittal and A.Mittal, Design of Electrical Machines, Standard Publications and Distributors, Delhi, 2002.

Reference Books:
Department: EEE
Programme: B.TECH
Semester: SIXTH
Category: TA

Course Code | Course Name | Hours / Week | Credit | Maximum Marks |
--- | --- | --- | --- | --- |
EE116 | POWER ELECTRONICS | 3 | 4 | 100 |

Prerequisite: Should have through knowledge and completed the basic courses on electrical circuits analysis and electron devices and circuits

Objectives:

- To introduce power semiconductor devices with emphasis on switching characteristics, safe operating region and device protection.
- To discuss in details the various power conversion methods, converter topologies, switching circuit with modes of operation, derive input output relation and evaluated performance along with control strategies and triggering circuits.

Outcome:

- On successful completion of the course, the students shall be familiar and knowledgeable on power devices and their application to various power electronic converter topologies, control strategies and applications.

UNIT – I

**Power Semiconductor Devices**

Power Semiconductor Devices - Power diodes, power transistors, SCRs, Triac, GTO, Power MOSFETs, IGBTs- Principles of operation and characteristics, ratings, protection and gate drive circuits turn-on, turn-off methods; protection-di/dt, dv/dt, over current, overvoltage; specifications, losses, thermal characteristics, series and parallel operation, triggering circuits.

UNIT – II

**Controlled Rectifiers**

Operation and analysis of single and three phase rectifiers – half and fully controlled Converters with R, RL and RLE loads with and without freewheeling diodes; converter and inverter operation – waveforms, gate time control, output voltage, input current, power factor, effect of load and source inductances. Power factor and harmonic improvement methods in converters. Series converter, twelve pulse converters, dual converter – four-quadrant operation with and without circulating current.

UNIT – III

**Choppers**

Principles of high power chopper circuits – class A, B, C, D and E chopper, voltage commutated, current commutated chopper, multi-phase chopper-multi-quadrant operation, principle of operation of buck, boost and buck boost regulators; time ratio control, variable frequency control, duty cycle.

UNIT – IV

**Inverters**

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

UNIT – V

**AC-AC Conversion**

AC voltage controller - Principle of single phase and three-phase AC voltage controller –ON/OFF and phase angle control Cycloconverters- Principle of single phase and three phase cycloconverters circuits, input and output performances-different control techniques and firing pulse generation. Applications – regulated power supply, UPS, solid-state motor starters, HVDC systems, reactive power compensation.

Total contact Hours: 45
Total Tutorials: 15
Total Practical Classes: 0
Total Hours: 60

Text Books:

Reference Books:
4. Williams B.W., Power Electronics Devices, Drivers, Applications and Passive Components, McMillan
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE117</td>
<td>MEASUREMENTS AND CONTROL</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To enable the students to understand the basics of calibration and extension of range of different meters
- To make the students acquire knowledge about the various circuit theorems using PSPICE simulation and control system oriented MATLAB experiments.

**Objectives:**
- The course enables the students to know the working principle of various bridges, magnetic and frequency measurements and analyze the concepts of signal converters, instrumentation amplifier and transducers.

**Outcome:**

**LIST OF EXPERIMENTS**
2. Verification of network theorems (PSPICE Simulation and Practical method).
3. Extension of range and meters (voltmeter and ammeter).
4. Calibration of energy meters (single phase and three phase)
5. Measurements on supply systems (frequency, phase and phase sequence).
6. Measurements on Magnetic system (B-H loop and Magnetic Losses).
7. Operation amplifier application (Instrumentation amplifier, Signal converter with grounded and floating loads).
8. Transducer based experiments (Temperature and displacement and LDR).
10. Verification of various exercises and plots in control system in MATLAB simulation.

**Total contact Hours: -**

**Total Tutorials: -**

**Total Practical Classes: 45**

**Total Hours: 45**
Department: EEE  
Programme: B.Tech.

Semester: FIFTH  
Category: LB

Course Code | Course Name                   | Hours / Week | Credit | Maximum Marks |
-------------|-------------------------------|--------------|--------|---------------|
EE118        | ELECTRONICS LAB-II            | L  T  P  C  CA  SE  TM |  |  |  |

Prerequisite: -

Objectives:
- To enable the students to design and analyze the operation of some of the basic analog electronic circuits such as amplifiers, oscillators and multi-vibrators.
- To introduce the basic logic gates and flip-flops which help them to build any digital electronic circuits. Further, the students are introduced with some of the digital circuit applications like arithmetic circuits, multiplexers, de-multiplexers and counters developed using logic gates and flip flops.

Outcome:
- At the end of the course the students are able to build up any type of analog or digital electronic circuits.

LIST OF EXPERIMENTS
1. Frequency response characteristics of a single stage RC coupled transistor amplifier.
2. Design of transistor based RC phase-shift oscillator.
3. Design of UJT relaxation oscillator.
4. Design of transistor based astable and monostable multivibrator.
5. Design of transistor based Schmitt trigger.
6. Study of logic gates, verification of de Morgan laws using logic gates, implementation of basic gates using universal gates.
7. Study and design of adders, subtractors and combination of all logic circuits using K-map simplification.
8. Design of multiplexors and de-multiplexors using logic gates.
9. Design and testing of SR, D, JK (Master-slave configuration) and T flip-flops using universal gates.
10. Design of code converters using logic gates.
11. Design of 4-bit Up/Down and Mod-10 counter sing Master-slave

Total contact Hours: -  
Total Tutorials: -  
Total Practical Classes: 45  
Total Hours: 45
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE119</td>
<td>POWER SYSTEM ANALYSIS</td>
<td>3 1</td>
<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To provide students a major design experience in power system that prepares them for engineering practice
- To make them able to model the Power System components including generator, line/cable, and transformer, shunt element, and load. Also Formulate the network matrices for the Power Systems, formulate power flow problems and develop solution using Gauss, Gauss-Seidal, Newton-Raphson and fast decoupled methods.
- To analyze symmetrical and unsymmetrical faults and solve for the fault voltages and currents for various types of faults.

**Objectives:**
- The graduates will be able to formulate and analyze symmetrical and unsymmetrical faults occurring in power system networks
- They can estimate the stability of the system on the basis of real time data.

**Outcome:**

**UNIT – I**  
Power System Component Modeling  
Hours: 9  
Representation of Power system components like synchronous machines, induction machines, transformers, transmission lines, loads etc, for steady state analysis-Per unit Quantities, Impedance and reactance diagram-Formulation of network matrices for the power systems- Bus impedance by building algorithm method and bus admittance by direct inspection method and singular transformation method, reduction techniques on network matrices for network changes.

**UNIT – II**  
Load Flow Analysis  
Hours: 9  
Formulation of load flow equations-Solution of simple problems by considering voltage controlled buses, tap changing transformers, phase shift control, line flow calculations-Effect due to new lines, loads and voltages-Gauss, Gauss-Seidel method, Newton-Raphson method and Fast Decoupled method for calculating line voltages and real and reactive powers.

**UNIT – III**  
Symmetrical Components  
Hours: 9  
Definition-Introduction-Review of symmetrical components-Transformation matrices used in resolution of unbalanced voltages and currents- Positive, Negative and Zero sequence networks of power system components like synchronous machines, induction machines, transformers, transmission lines, loads.

**UNIT – IV**  
Symmetrical and Unsymmetrical Fault Analysis  
Hours: 9  

**UNIT – V**  
Stability Analysis  
Hours: 9  
Definition - Classification of Power System Stability – Power angle equation-Derivation of Swing equation – solution of Swing Equation using step by step method (Method -1 & Method 2) - Equal Area Criterion (EAC)–Critical Clearing Angle–Applications of EAC to different case studies.

<table>
<thead>
<tr>
<th>Total contact Hours: 45</th>
<th>Total Tutorials: 15</th>
<th>Total Practical Classes:</th>
<th>Total Hours: 60</th>
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</table>

**Text Books:**

**Reference Books:**

Websites:                                                                                                                      

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<th>Course Code</th>
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<tbody>
<tr>
<td>EE120</td>
<td>MICROPROCESSORS AND MICROCONTROLLERS</td>
<td>3 1 -</td>
<td>4 40 60 100</td>
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</tbody>
</table>

**Prerequisite:**
- To introduce the generalized concepts of functional blocks namely registers, ALU, timing and control and interfacing of the microprocessor unit (Intel 8085)
- To introduce the concept of interfacing memory and I/O devices and data transfer techniques
- To enable the students understand the functions of various peripherals namely programmable I/O ports, timers, interrupt controller, keyboard/display interface, serial communication interface etc which support efficient operation of the microprocessor.

**Outcome:**
- At the end of the course the students will be able to know about the functions and operations of the microprocessors and microcontrollers and develop assembly code using different addressing modes for various applications

**UNIT – I**
Microprocessor Architecture


**UNIT – II**
8085 Programming

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

**UNIT – III**
Memory I/O Interfacing and Interrupts

Memory Interfacing-Compatibility between memory and microprocessor unit–Address space– Partitioning of address space–Interfacing input devices. Types of data transfer–8085Interrupt structure- vectored interrupts – Interfacing data converters.

**UNIT – IV**
Programmable Devices and Microprocessor Applications

Study of Architecture and programming of ICs: Programmable Peripheral device (8255), Timer/ Counter (8253), Programmable keyboard display interfaces (8279) - Programmable interrupt controller (8259) - USART (8259). Microprocessor Applications-stepper motor control - temperature control-traffic light control.

**UNIT – V**
8051 Microcontroller


Total contact Hours: 45
Total Tutorials: 15
Total Practical Classes: 24
Total Hours: 60

**Text Books:**

**Reference Books:**
### Course Details

**Department:** EEE  
**Programme:** B.TECH  
**Semester:** FIFTH  
**Category:** TA

<table>
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<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE121</td>
<td>ENERGY ENGINEERING</td>
<td>4</td>
<td>-</td>
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</table>

#### Prerequisite:
- To introduce various energy resources right from the conventional energy systems to upcoming renewable energy systems.
- The course offers details on hydroelectric technology, wind, solar and biomass energy technologies.
- To enable the students to understand the necessity of energy conservation and management.

#### Objectives:
- The graduates will be knowing all the conventional and renewable energy resources and their design and analysis for solving the energy crisis of modern world.

### UNIT – I
**Energy Resources**  

**Hours:** 12

### UNIT – II
**Conventional Energy Sources**  
Coal fired steam thermal power plant— layout, working principle- Gas turbine power plant— various options, layout, working principle- Nuclear power plants: fuels, nuclear fuel cycle, reactors, nuclear power plant, and nuclear waste management.

**Hours:** 12

### UNIT – III
**Hydro and Ocean Energy Electric Technologies**  
Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects– Hydro-Thermal coordination-Ocean Energy Technology- Power plant-limitations.

**Hours:** 12

### UNIT – IV
**Wind, Solar Energy and DG Technologies**  

**Hours:** 12

### UNIT – V
**Energy Conservation and Management**  

**Hours:** 12

### Total contact Hours: 60  
**Total Tutorials:**  
**Total Practical Classes:**  
**Total Hours: 60**

### Text Books:

### Reference Books:

### Websites:
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62
**Department**: EEE  
**Programme**: B.Tech.  
**Semester**: SIXTH  
**Category**: LB

<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
<tr>
<td>EE122</td>
<td>ELECTRONICS LAB-III</td>
<td>-</td>
<td>3</td>
<td>60</td>
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</tbody>
</table>

**Prerequisite:** 
- To introduce the students various analog and digital integrated circuits and their applications
- To enable the students acquire knowledge about the design and development of analog electronic circuits like voltage regulators, amplifiers, oscillators, filters and multi vibrators using appropriate analog ICs
- To enable the students to realize the operation of digital circuits like counters, code converters, multiplexers, demultiplexers, encoders, decoders and digital to analog converters using suitable ICs.

**Objectives:**

**Outcome:**

- At the end of the course, the students will have a strong knowledge in the design and realization of any type of analog/digital electronic circuits.

**LIST OF EXPERIMENTS**

1. Design of low and high voltage regulators using IC 723.
2. Design of inverting, non-inverting amplifiers and voltage follower circuit using OPAMP 741.
3. Design of analogue adder and subtractor using OPAMP741.
4. Design of analogue integrator and differentiator circuit using OPAMP741.
5. Design of log and antilog amplifier using OPAMP741.
8. Design of filter circuits (I order and II order) using OPAMP741.
9. Design of comparator circuits (PWM and SPWM) and Schmitt trigger circuit using OPAMP741.
10. Digital to analogue converters using OPAMP741.
11. Design of Monostable and Astable multivibrator using IC555.
12. Design of ring counter and Johnson counters.

**Total contact Hours**: -  
**Total Tutorials**: -  
**Total Practical Classes**: 45  
**Total Hours**: 45
Department: EEE  
Programme: B.Tech.  
Semester: SIXTH  
Category: LB  

<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
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<tbody>
<tr>
<td>EE123</td>
<td>MICROPROCESSORS AND MICROCONTROLLERS LAB</td>
<td>-</td>
<td>3</td>
<td>2</td>
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</tbody>
</table>

**Prerequisite:** -

**Objectives:**
- To equip the students with a good knowledge on Microprocessor and microcontroller programming and their applications
- To introduce the concepts of interfacing, auxiliary units to the microprocessor and microcontrollers

**Outcome:**
- The course enables the students to incorporate these concepts into their electronic designs, where control can be achieved via a microprocessor or microcontroller implementation
- By the end of the course, the students will be able to write the assembly language programs in 8085 microprocessor and 8051 microcontroller and execute them

**LIST OF EXPERIMENTS**

I: 8085 Microprocessor based experiments:
1. 8/16 bit arithmetic operations (Binary and BCD)  
2. Block operation using pointers with and without overlap  
3. Generation of Series  
5. Digital clock Simulation using counters/interrupts.

II. 8051 Microcontroller based experiments:
6. Arithmetic operations  
7. Code conversions  
8. Array operations (searching, sorting)

III: Interfacing experiments (8085/8051 based):
11. ADC/DAC interface-generation of Triangular wave and stair case wave.  
12. Stepper motor interface

Total contact Hours: -  
Total Tutorials: -  
Total Practical Classes: 45  
Total Hours: 45

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64
Department : EEE  
Programme : B.Tech.  
Semester : SIXTH  
Category : LB  

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<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tr>
<td>EE124</td>
<td>POWER ELECTRONICS LAB</td>
<td>-</td>
<td>3</td>
<td>2</td>
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</tbody>
</table>

Prerequisite: Should have through knowledge and had attended the basic courses on electrical circuits analysis, electron devices & circuits and the power electronics.

Objectives:
- To conduct experiments and understand the trigger circuits as applied to various power converters, verify the operation and control of various power converters as applied to ac-dc, dc-dc, ac-ac, dc-ac power conversion and some application.

Outcome:
- Trained to model and simulate the various power converters and firing pulse generation. Their operations, design philosophies and applications are verified through simulation and experiments.

**LIST OF EXPERIMENTS**

**POWER CONVERTERS**

1. Switching characteristics of MOSFET and IGBT  
2. SCR Triggering circuits (using RC/ UJT/Counters etc)  
3. Single phase Converters (Semi/Full Converters)  
4. Three-phase converter circuits (Semi/Full Converters)  
5. Forced commutation circuits  
6. DC-DC converters (Single/Multiple quadrant/Class A – E)  
7. AC Voltage controllers (Single/Three Phase)  
8. PWM inverter (Single/Three Phase)  
9. Square Wave Inverters (VSI with 120°/180° Mode or LCI with Series/Parallel)  
10. Cycloconverters

**APPLICATIONS**

11. Study on ZVS and ZCS Operation  
12. Study on speed control concepts in AC/DC motors  
13. Study on switched mode power supplies

Total contact Hours: -  
Total Tutorials: -  
Total Practical Classes: 45  
Total Hours: 45
### Course Code: HS102  
#### Course Name: GENERAL PROFICIENCY

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<td>3</td>
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</table>

#### Prerequisite:
- The need to make young graduates “employable” has become all the more important especially in the wake of looming man power crisis that is often highlighted by media reports, and dismal employment ratio
- Taking into consideration the “employability” factor this course has been designed to make the students linguistically proficient by honing their language skills.

#### Objectives:
- The students will be capable to get the knowledge on importance of communication, soft skills, importance of speaking, etiquette, and verbal and numerical aptitude.

#### Outcome:
- **ART OF COMMUNICATION**
  - Verbal and Non-verbal Communication–Barriers to Communication–Importance of Body Language – Effective Listening–Feedback

- **INTRODUCTION TO SOFT SKILLS**

- **WRITING**
  - Importance of Writing–Written Vs Spoken Language–Formal and informal Styles of writing–Resources for improving writing– Grammar and Usage – Vocabulary Building – SWOT analysis

- **SPEAKING PRACTICE**

- **APTITUDE**
  - Verbal -non verbal
  - Numerical aptitude

<table>
<thead>
<tr>
<th>Total contact Hours:</th>
<th>Total Tutorials:</th>
<th>Total Practical Classes: 45</th>
<th>Total Hours: 45</th>
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</table>

#### Text Books: 
- 

#### Reference Books: 
- 

#### Websites: 
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<table>
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<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tr>
<td>EE125</td>
<td>POWER SYSTEM OPERATION AND CONTROL</td>
<td>L 3 T 1 P -</td>
<td>C 4</td>
<td>CA 40 SE 60 TM 100</td>
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</table>

**Prerequisite:**
- To introduce the security aspects of the power system, basic structure of power system operation and control, load forecasting and unit commitment, active power control, dispatch schedule, voltage control, generation and absorption of reactive power
- To enable the students to solve the economic load dispatch problems, understand the fundamentals of excitation system, generation and absorption of reactive power and voltage control methods

**Objectives:**
- The graduates will be able to analyze and control the P-F and Q-V loop disturbances and can solve power system planning issues in modern power system operation and control

**Text Books:**

**Reference Books:**

**Websites:**
<table>
<thead>
<tr>
<th>Department : EEE</th>
<th>Programme : B.TECH</th>
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<td>Semester : SEVENTH</td>
<td>Category : TA</td>
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<tr>
<td><strong>Course Code</strong></td>
<td><strong>Course Name</strong></td>
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<tr>
<td>EE126</td>
<td>PROTECTION AND SWITCHGEAR</td>
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<tr>
<td><strong>Prerequisite:</strong></td>
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<tr>
<td><strong>Objectives:</strong></td>
<td></td>
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<tr>
<td>• To introduce the power system protection and the working of relays</td>
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<tr>
<td>• To enable the students to understand the types of relays that are application specific,</td>
<td></td>
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<tr>
<td>design of protection equipment for each power system component based on the</td>
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<tr>
<td>performance metrics like generator capability curve and fault calculations, study the</td>
<td></td>
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<tr>
<td>types of circuit breakers and fuses and their construction.</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome:</strong></td>
<td></td>
</tr>
<tr>
<td>• The graduates will be able to formulate design and analyze any power system</td>
<td></td>
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<tr>
<td>protection network for practical requirements.</td>
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</tbody>
</table>

**UNIT – I**

Introduction and General Philosophies


**UNIT – II**

Relay Fundamentals and Characteristics

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

**UNIT – III**

Components Protection


**UNIT – IV**

Design Aspects of Circuit Breakers


**UNIT – V**

Circuit Breakers


**Total contact Hours: 45**

**Total Tutorials: 15**

**Total Practical Classes:**

**Total Hours: 60**

**Text Books:**


**Reference Books:**

<table>
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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE127</td>
<td>POWER SYSTEM LAB</td>
<td>L T P C CA SE TM</td>
<td>3 2 60 40 100</td>
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</tbody>
</table>

Prerequisite: -

Objectives:
- To enable the students to acquire knowledge on the programming and simulation of power systems using computer packages

Outcome:
- At the end of the course, students will be able to develop computer programs for computation of power system components in per units, formulation of the bus admittance and impedance matrices, load dispatch, load flow, short circuit and transient stability studies.

**LIST OF EXPERIMENTS**

1. Computation of Power System Components in Per Units.
2. Formulation of the bus admittance matrix by Direct inspection and Singular transformation method.
3. Formation of bus impedance matrix by Building algorithm method
4. Load Flow study by Gauss–Seidel method
5. Load Flow study by Newton–Raphson method
7. Symmetrical components for different case studies.
8. Short circuit studies for symmetrical and unsymmetrical (LL, LG, LLG) fault studies.
9. Numerical Integration of Swing equation.
10. The Equal-Area Criterion.
12. Load Frequency Control.

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: 45  Total Hours: 45
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
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<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE128</td>
<td>PROJECT WORK (PHASE I)</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

**Prerequisite:**

- To enable the students to work in convenient group of not more than four members in a group on a project involving analytical, experimental, design combination of these related to one or more areas of Electrical & Electronics Engineering.

**Objectives:**

- At the end of the course, the students will be able to model and do simulation of any research area and experimentally verify the simulation results in the hardware lab.

**Outcome:**

The objective of the first phase of the project is primarily dedicated to identify the problem to be addressed in consultation with the project supervisor, leading subsequently to mathematical formulation of the problem after completing an intensive literature survey. Once the problem is identified and formulated, the project team would search/examine for various methodologies reported in literature for solving the problem and boil down to one single approach that is optimal as well as computationally less expensive. After completing this procedure, in first phase, preliminary works towards solving the problem would be attempted. This phase would include learning software (programming languages/tool boxes) and simulation packages (for simulating the circuits) that would help the team to solve the problem in the second phase. If the project involves hardware development, it is expected that the team would complete the simulation studies of the problem taken up in this phase itself. In addition to theoretical/technical conception of the project work, effective presentation skills and group dynamics will be tested in the process by a review committee composed of the faculty members of the department. In the sequel, the committee members will suggest tasks to be accomplished in the next phase.

**Total contact Hours:** 45  
**Total Tutorials:** 45  
**Total Practical Classes:** 45  
**Total Hours:** 45  

**Websites:** -
**Course Code** | **Course Name** | **Hours / Week** | **Credit** | **Maximum Marks**  
---|---|---|---|---  
EE129 | PROFESSIONAL ETHICS AND PRACTICE | - | 3 | 100  

**Prerequisite:**
- To understand the concepts of ethics and moral
- To understand ethical problems and analyze them
- To learn about the moral dilemmas and framework for solving them
- To learn about the theories of moral development
- To study various ethical theories and undertake case studies

**Objectives:**
- Knowledgeable in ethical and moral principles
- Ability to understand the ethical problems and analyze them
- Knowledge and skills to confront moral issues and dilemmas
- Knowledgeable in major ethical theories
- Ability to apply the ethical theories to resolve moral issues

---

**Outcome:**

The course should cover the following topics by way of Seminars, Expert Lectures and Assignments.

- Types of Ethics – Normative Ethics, Meta-Ethics and Applied Ethics.
- Ethical problems and analysis – Engineering Ethics – Micro-Ethics, Macro-Ethics.
- Ethical analysis – Normative Inquiry, Conceptual Inquiry and Factual Inquiry – Case Study.
- Kohlberg’s theory of moral development – Heinz’s dilemma – Gilligan’s theory – Case study.
- Consensus and Controversy – Authority and Autonomy – Multiple Motives – Safety in Engineering.
- Engineering as Social Experimentation.

**Total contact Hours:** 45  
**Total Tutorials:** 45  
**Total Practical Classes:** 45  
**Total Hours:** 45  

**Text Books:**


**Reference Books:**

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<td>EE130</td>
<td>COMPREHENSIVE TEST AND VIVA-VOCE</td>
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**Prerequisite:**

**Objectives:**

- The objective of comprehensive test is to study and understand the subjects on all areas of Electrical & Electronics Engineering

**Outcome:**

On successful completion of the course, students will be able to:

- Have the ability to attend any kind of aptitude examination for future settlement
- Problem solving ability will be gained by the students

The objective of the comprehensive viva-voce is to test the fundamental knowledge of the students in the domain of study. The students will be tested on theoretical as well as practical knowledge imbibed over the past semesters on the discipline of Electrical and Electronics Engineering. The students will be tested on their analytical ability by posing them an intricate problem. The reasoning skill sets of the student will be examined by questioning them on system modeling, circuit troubleshooting, fault identification, fault classification from study of system behavior/characteristics etc. A small presentation may be sought from each student on any latest happenings in the field of study.

**Total contact Hours:** 45 **Total Tutorials:** 45 **Total Practical Classes:** 45 **Total Hours:** 45

**Websites:** -
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<td>EE131</td>
<td>PROJECT WORK (PHASE II)</td>
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**Prerequisite:**

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

**Objectives:**

- At the end of the course, the students will be able to work in any field of Electrical & Electronics Engineering with analytical, experimental, design combination of these related to one or more areas.

In this phase, the team would solve the problem taken up for study. Hardware development would be completed in this phase, and the hardware results will be compared with the simulation results completed in the first phase to validate the effectiveness of the developed setup. Necessary inferences have to be drawn from the studies carried out and the same should be presented before the committee members. If the project involves intensive analytical procedure, the analysis has to be completed and suitable comparison to existing methodologies reported in literature should be done to validate the correctness as well as effectiveness of the work. Rigorous review by the committee will be carried out in the process to ascertain whether the work qualifies as a suitable project at the graduate level. Each team is expected to present their work at National/International conferences or at the students’ technical symposiums. Teams that have come out with novel contributions will be encouraged to publish their work in any referred journals.

**Total contact Hours:** 135  
**Total Tutorials:** 135  
**Total Practical Classes:** 135  
**Total Hours:** 135  
**Websites:** -
Department : EEE  
Programme : B.Tech

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<th>Credit</th>
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<tr>
<td>EEP01</td>
<td>RENEWABLE ENERGY SOURCES</td>
<td>4</td>
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</table>

Prerequisite:

Objectives:

- To make the students learn about the concept of various renewable energy sources and instigate knowledge on the production strategies of renewable energy sources.

Outcome:

- The students will be able to formulate, design and analyze any distribution generation system using renewable energy resources like solar, wind, biogas and geothermal power generation.

UNIT – I  General  Hours: 12


UNIT – II  Solar Energy and Applications  Hours: 12

Solar radiation-Principles of solar energy collection-Types of collector–Characteristics and Principles of different types of collectors and their efficiencies, Solar Energy applications-water heaters, air heaters, solar cooling; solar drying and power generation -solar tower concept (solar plant) -solar pump.

UNIT – III  Wind Energy  Hours: 12


UNIT – IV  Ocean & Tidal Energy  Hours: 12

Ocean and Tidal energy conversion-working principle of OTEC-Anderson closed cycle OTEC System - Application of Merits and demerits of ocean energy technologies. Tides- spring tide, neap tide, daily and monthly variation, Tidal range, Tidal Power-Types of tidal power plants, single basin& double basin schemes, main requirements in tidal power plants, energy storage, prospects of tidal power.

UNIT – V  Bio-Energy  Hours: 12

Energy from Bio-mass-Biogas plants various types- Industrial wastes-Municipal waste- Burning plants –Energy from the Agricultural wastes Applications.

<table>
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<tr>
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Text Books:


Reference Books:


Websites:
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<tr>
<td>EEP02</td>
<td>FUZZY AND NEURAL SYSTEMS</td>
<td>4</td>
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<td>60</td>
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</tbody>
</table>

**Prerequisite:**
- To introduce the fundamental concepts of Fuzzy set theory, Fuzzy inference mechanisms and defuzzification concepts
- To introduce neural learning types such as supervised learning and unsupervised learning
- To solve some design examples for fuzzy and neural based applications

**Objectives:**
- The graduates will be knowing the importance of fuzzy sets and fuzzy inference for solving practical problems with uncertainty
- They can design fuzzy and neuro systems for real time applications.

**UNIT – I**
**Introduction**
Hours: 12
Conventional sets verses fuzzy sets – Basic concepts and definitions. Operation in fuzzy sets– NOT, AND and OR operators. Convexity of fuzzy sets-lamda acts on fuzzy sets. Membership functions -type’s choice and membership value assignment methods.

**UNIT – II**
**Fuzzy Logic**
Hours: 12
Fuzzy relations-equivalence and tolerance- Fuzzy if then rules– types. Rule based models– Mamdani and TSK models. Fuzzy to crisp conversions– defuzzification types.

**UNIT – III**
**Neural Networks**
Hours: 12

**UNIT – IV**
**Neural Architecture and Algorithm**
Hours: 12

**UNIT – V**
**Applications**
Hours: 12
Brief theory of bidirectional associative memories and Adaptive resonance theory- Neuro-fuzzy systems– Application of neural and fuzzy system to electrical Engineering.

**Total contact Hours:** 60  **Total Tutorials:**  **Total Practical Classes:**  **Total Hours:** 60

**Reference Books:**
2. Hagen, Demuth and Beale, Neural Network design, Thompson Learning, 2002.

**Websites:**
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Department : EEE  
Programme : B.Tech
Semester :  
Category : TA

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<td>EEPO3</td>
<td>UTILIZATION OF ELECTRICAL ENERGY</td>
<td>4</td>
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**Prerequisite:**
- To provide students a basic understanding of illumination, type of lighting schemes and lamps
- To enable the students to acquire knowledge about different types of heating and welding and to understand the working principle of various electrical drives and their control
- To enable the students to analyse electric traction and the electrolytic process

**Objectives:**
- The graduates will be able to design illumination systems for domestic, commercial and industrial environment
- They can design drive systems for DC and AC traction systems
- At the end of the course, the students will be able to know about the proper utilization of electrical energy

**Outcome:**
- Production of light—Determination of MHCP and MSCP – Polar curves of different types of sources—Rousseau’s construction–Lighting schemes and calculations–Factory lighting–Flood lighting– Electric lamps– Gaseous discharge – High pressure and low pressure

**UNIT – I**
Illumination  
Hours: 12

**UNIT – II**
Electric Heating And Welding  
Hours: 12

**UNIT – III**
Electric Drives and Control  
Hours: 12

**UNIT – IV**
Electric Traction  
Hours: 12

**UNIT – V**
Electrolytic Processes  
Hours: 12

**Text Books:**

**Reference Books:**
Course Code | Course Name | Hours / Week | Credit | Maximum Marks |
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<tr>
<td>EEPO4</td>
<td>POWER QUALITY</td>
<td>4 - - - 4</td>
<td>40 60 100</td>
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Prerequisite:
- To study the production of voltages sags, over voltages and harmonics and methods of control.
- To study various methods of power quality monitoring.

Objectives:
- At the end of the course, the students will be able to get the knowledge about voltage sag, swell, harmonic, control and diagnostic techniques for various power quality problems.

Outcome:
- To study the production of voltages sags, over voltages and harmonics and methods of control.
- To study various methods of power quality monitoring.

UNIT – I Introduction to Power Quality Hours: 12
Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients - short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT – II Voltage Sags and Interruptions Hours: 12
Sources of sags and interruptions - estimating voltage sag performance. Thevenin’s equivalent source - analysis and calculation of various faulted condition. Voltage sag due to induction motor starting. Estimation of the sag severity - mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches.

UNIT – III Over Voltages Hours: 12
Sources of over voltages - Capacitor switching – lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection – shielding - line arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

UNIT – IV Harmonics Hours: 12

UNIT – V Power Quality Monitoring Hours: 12
Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – quality measurement equipment - spectrum analyzer - flicker meters - disturbance analyzer.

Applications of expert systems for power quality monitoring.

Total contact Hours: 60 | Total Tutorials: | Total Practical Classes: | Total Hours: 60

Text Books:
1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, Electrical Power Systems Quality, McGraw Hill, 2003. (For Chapters 1, 2, 3, 4 and 5)

Reference Books:
1. G.T. Heydt, Electric Power Quality, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
2. J. Arrillaga, N.R. Watson, S. Chen, Power System Quality Assessment, (New York: Wiley, 1999). (For Chapters 1, 2, 3, 4 and 5)

Websites:
Department: EEE  
Programme: B.Tech

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<td>EEP05</td>
<td>FACTS CONTROLLERS</td>
<td>4</td>
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</table>

**Prerequisite:**
- To aid the students to study the basics of real and reactive conventional compensators, understand the concept of flexible AC transmission systems and the associated problems and review the static devices for series and shunt control
- The course offers the study on the operation of controllers for enhancing the transmission capability and the operation, control and application of different FACTS devices and custom power devices.

**Objectives:**
- The graduates can able to formulate, design and analyze any flexible AC transmission controller for real and reactive power compensation in modern power system operation and control.

**Outcome:**

**UNIT – I**  
**Compensators**  
Hours: 12  
Introduction to FACTS controllers—Reactive power control-Reactive power, uncompensated Transmission line, reactive power compensation—Principles of conventional reactive power compensators-Synchronous condensers, saturated reactor, phase angle regulator and other controllers.

**UNIT – II**  
**Thyristor Controlled Shunt Compensator**  
Hours: 12  
Objective of shunt compensation—Principle and operating characteristics of Thyristor Controlled Reactor(TCR)—Thyristor Switched Capacitor (TSC)—Static VAR Compensators (SVC)—SVC control system—SVC voltage regulator model—Transfer function and dynamic performance of SVC—Transient stability enhancement and power oscillation damping, mitigation of sub- synchronous resonance.

**UNIT – III**  
**Thyristor Controlled Series Compensator (TCSC)**  
Hours: 12  

**UNIT – IV**  
**Vsc Based Shunt and Series Compensator**  
Hours: 12  
Static Synchronous Compensator (STATCOM)- Principle of operation- VI Characteristics-Harmonic performance—Steady state model—SSR mitigation-Static Synchronous Series Compensator(SSSC)-Principle of operation and characteristics of SSSC—control range and VA rating—capability to provide real power compensation—Immunity to sub-synchronous resonance—control scheme for SSSC.

**UNIT – V**  
**Unified Power Flow Controller**  
Hours: 12  
Basic operating principles—conventional transmission control capability of UPFC—Independent Real and reactive power flow control—control scheme for UPFC—Basic control system for P and Q control—dynamic performance.

**Total contact Hours: 60**  
**Total Tutorials:**  
**Total Practical Classes:**  
**Total Hours: 60**

**Text Books:**

**Reference Books:**
3. Yong Hua Song and Allan T Johns, Flexible AC Transmission System (FACTS), IEEE Power Engineering Series-


Websites:

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<th>Department</th>
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<td>Total Tutorials</td>
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**Prerequisite:**
- To introduce classical controller synthesis techniques like PI control, lead-lag compensation and state space analysis of linear dynamic systems
- To make the students able to design controllers using state-feedback control approach
- To teach the students the optimal control using LQR technique

**Objectives:**
- At the end of the course, the students will be able to analyze and synthesize controller for linear systems in state-space framework.

**UNIT – I**
**Introduction To Classical Design**
Hours: 9

**UNIT – II**
**State Space Analysis**
Hours: 9

**UNIT – III**
**State Space Design**
Hours: 9

**UNIT – IV**
**Stability**
Hours: 9

**UNIT – V**
**Optimal Control**
Hours: 9
Linear quadratic optimal regulator (LQR) problem formulation – optimal regulator design by parameter adjustment (Lyapunov method) – optimal regulator design by Continuous – time Algebraic Riccati Equation (CARE) – optimal controller design using LQG framework.

**Text Books:**

**Reference Books:**

**Websites:**
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<th>Department</th>
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<td>EEP07</td>
<td>ELECTRICAL SAFETY AND QUALITY MANAGEMENT</td>
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**Prerequisite:**
- To introduce IE rules and its significance, electrical safety in residential, commercial and industrial installations
- To enable the students to know about the electrical safety in during installation, testing and commissioning, operation and maintenance
- To enable the students to know more about the quality management

**Objectives:**
- The graduates will be knowing the electrical safety aspects for the safe working environments and can maintain the quality of the power supply for the industrial requirements.

**UNIT – I**
**Review of IE Rules and Acts and Their Significance**

**UNIT – II**
**Electrical Safety in Residential, Commercial and Agricultural Installations**

**UNIT – III**
**Safety During Installation, Testing and Commissioning, Operation and Maintenance**

**UNIT – IV**
**Electrical Safety in Hazardous Areas**

**UNIT – V**
**Quality Management**

**Total contact Hours:** 60
**Total Tutorials:**
**Total Practical Classes:**
**Total Hours:** 60

**Text Books:**

**Department:** EEE  
**Programme:** B.Tech

**Semester:**  
**Course Code:** EEP08  
**Course Name:** SPECIAL ELECTRICAL MACHINES

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**Prerequisite:**

- To explore the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines
- To impart knowledge on constructions, working and performance of fractional HP machines, switched reluctance motor, PMSM, PMBL DC motors and stepper motors.

**Objectives:**

- The students can design and analyze any modern drive system using special machines like stepper motor, switched reluctance motor, synchronous reluctance motor, BLDC or PM synchronous motor.

**Course Code** | **Course Name** | **Hours:**
--- | --- | ---
EEP08 | SPECIAL ELECTRICAL MACHINES | 12

**UNIT – I**  
Single Phase Machines  

**UNIT – II**  
Stepper Motors
Constructional features-principle of operation-Types of motors– Modes of operation–Drive system and circuit control of Stepper motor –Static and Dynamic Characteristics and Applications.

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

**UNIT – IV**  
Permanent Magnet Brush LessDC Motors

**UNIT – V**  
Permanent Magnet Synchronous Motors

**Total contact Hours:** 60  
**Total Tutorials:**  
**Total Practical Classes:**  
**Total Hours:** 60

**Text Books:**


**Reference Books:**

1. A. Hughes, Electric Motors and Drives, Affiliated East-West Press Pvt., Ltd., 2007

**Websites:**

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<td>EEP09</td>
<td>DIGITAL SYSTEM DESIGN USING VHDL</td>
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</table>

**Prerequisite:**
- To enable the students to design digital systems using VHDL and various programmable logic devices, CAD tools, simulation aspects and chip configuration
- The students will be taught with various VHDL concepts and programming and design steps for combinational circuits using VHDL
- To enable the students to design both synchronous and asynchronous sequential circuits

**Objectives:**
- The graduates will be able to design and analyze digital systems using VHDL for practical applications.

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

**UNIT – II VHDL Concepts**

**UNIT – III VHDL Programming**
Subprograms and Packages – Predefined Attributes – Configurations – VHDL Synthesis – constraints and attributes.

**UNIT – IV Combinational Circuit Design**

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

**Total contact Hours: 60**  
Total Tutorials:  
Total Practical Classes:  
Total Hours: 60

**Text Books:**

**Reference Books:**

**Websites:**
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<td>EEP10</td>
<td>HIGH VOLTAGE ENGINEERING</td>
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**Prerequisite:**
- To enable an engineering student to understand the concept to of insulation coordination between various electrical equipments in installation
- The course describes the various methods of generating high voltages and currents and various techniques of measuring high voltages and currents
- It details the study on break down phenomena in solid, liquid and gaseous dielectrics and explores the various test techniques and standards to test electrical equipments.

<table>
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<tr>
<th>UNIT – I</th>
<th>Over Voltages and Insulation Coordination</th>
<th>Hours: 12</th>
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<tbody>
<tr>
<td></td>
<td>Causes of over voltages-lightning and switching over voltages- protection against over voltages-principles of insulation coordination.</td>
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<tr>
<th>UNIT – II</th>
<th>Generation of High Voltages and High Currents</th>
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<table>
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<tr>
<th>UNIT – III</th>
<th>Measurement of High Voltages and High Currents</th>
<th>Hours: 12</th>
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<tbody>
<tr>
<td></td>
<td>Measurement of AC,DC impulse and switching surges using sphere gaps, peak voltimeters, potential dividers and high speed CRO, op to Electronics method; Fiber optic method;</td>
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<table>
<thead>
<tr>
<th>UNIT – IV</th>
<th>Electrical Breakdown in Gases, Solids and Liquids</th>
<th>Hours: 12</th>
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<tr>
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<td>Ionization processes- Town send &amp;Streamer theory-the sparking voltage-Paschen’s law-Time lag for break down –Break down in non-uniform fields and corona discharges- Conduction and breakdown in pure and commercial liquids and solids dielectrics.</td>
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<th>UNIT – V</th>
<th>High Voltage Testing Practice</th>
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<td>Indian Standards/IEC specification for testing, correction factor-high voltage testing of power Apparatus-Insulators, Bushings, Isolators, Circuit Breakers, Cables, Transformers and Surge Diverters.</td>
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**Total contact Hours: 60**

**Text Books:**
**Department**: EEE  
**Programme**: B.Tech  
**Semester**:  
**Category**: TA

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<td>EEP11</td>
<td>POWER SYSTEM ECONOMICS</td>
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**Prerequisite**:  
- To make the students explore the structure of electrical tariff and the impact of depreciation on the power components  
- To make them learn the fundamentals of minimizing the cost of generation sources to meet the power system load are discussed with the aid of computational methods.

**Objectives**:  
- The graduates will be able to do economic dispatch and optimal power flow for practical power system test data.

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

**UNIT – I**  
**Economic Considerations**  
**Hours**: 12

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

**UNIT – II**  
**Economic Dispatch**  
**Hours**: 12


**UNIT – III**  
**Economic Operation**  
**Hours**: 12


**UNIT – IV**  
**Economic Control**  
**Hours**: 12


**UNIT – V**  
**Optimal Power Flow And Fundamentals Of Markets**  
**Hours**: 12


**Total contact Hours**: 60  
**Total Tutorials**:  
**Total Practical Classes**:  
**Total Hours**: 60

**Text Books**:  

**Reference Books**:  

**Websites**:  

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85
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<td>EEP12</td>
<td>DIGITAL CONTROL SYSTEM</td>
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**Prerequisite:**
- To introduce the students about the methods to obtain pulse transfer function, various analyses of digital control systems using frequency domain method and state space method
- It aims to teach different methods of analysis of stability of digital control system

**Objectives:**
- At the end of the course, an engineering graduate will be able to formulate, design and analyze digital control system for real world application.

**Outcome:**
- Introduction to discrete time control system—Pulse transfer function—general procedures for Obtaining pulse transfer functions—z domain equivalent to s-domain—correlation between time response and root location in the z plane—effect of pole zero configuration in z plane—transient response of sampled data systems—steady state error.

**UNIT – I**

**Introduction**

**Hours:** 12

**UNIT – II**

**State Variable Technique**

**Hours:** 12

**UNIT – III**

**Controllability, Observability And Stability**

**Hours:** 12


**UNIT – IV**

**Controller Design (Classical Approach)**

**Hours:** 12


**UNIT – V**

**Controller Design (State Space Approach)**

**Hours:** 12


**Total contact Hours:** 60     **Total Tutorials:** 0       **Total Practical Classes:** 40      **Total Hours:** 60

**Text Books:**


**Reference Books:**


**Websites:**

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<td>EEP13</td>
<td>EMBEDDED SYSTEM DESIGN</td>
<td>4 - - - 4</td>
<td>40 60 100</td>
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**Prerequisite:**
- To introduce various hardware and software concepts used to build embedded applications
- To introduce the various building blocks of embedded systems and its features outline the selection of a processor and memory organization concepts
- To make the students learn the bus organization, bus protocol and use of standard expandable buses, different types of data transfer using interrupts and DMA and concepts of real time operating systems, development and debugging tools.

**Objectives:**
- The graduates will be able to formulate design and analyze any embedded system for real time applications.

**Outcome:**

**UNIT – I**

**Introduction To Embedded System**

Introduction to functional building blocks of embedded systems–Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

Hours: 12

**UNIT – II**

**Processor And Memory Organization**

Structural units in a processor-selection of processor & memory devices-shared memory; DMA-Interfacing processor, memory and I/O units; memory management–Cache mapping techniques, dynamical location-Fragmentation.

Hours: 12

**UNIT – III**

**Devices & Buses For Devices Network**

I/O devices-timer &counting devices- serial communication using I^2^C, CAN, USB buses- Parallel communication using ISA, PCI,PCI/X buses, arm bus- interfacing with devices/ports, device drivers in a system– Serial port & parallel port.

Hours: 12

**UNIT – IV**

**I/O Programming Schedule Mechanism**

Intel I/O instruction–Transfer rate, latency; interrupt driven I/O- Non-maskable interrupts- Software interrupts, writing interrupt service routine in C &assembly languages-preventing interrupt overrun- disability interrupts-Scheduling–Thread states, pen ding threads, contexts witching, round robin scheduling, priority- based scheduling, assigning priorities, deadlock, watch dog timers.

Hours: 12

**UNIT – V**

**Real Time Operating System (RTOS)**

Introduction to basic concepts of RTOS, Basics of real time &embedded system operating systems, RTOS–Interrupt handling, task scheduling; embedded system design issues in system development process–Action plan, use of target system, emulator, use of software tools.

Hours: 12

Total contact Hours: 60 Total Tutorials: Total Practical Classes: Total Hours: 60

**Text Books:**


**Reference Books:**

Department : EEE                                      Programme : B.Tech
Semester :                                          Category : TA

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<td>EEP14</td>
<td>HVDC TRANSMISSION</td>
<td>4</td>
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Prerequisite:

Objectives:
- To introduce HVDC transmission systems and the features of HVDC and EHVC systems
- To offer a study on power converters which are the building blocks of the HVDC systems
- The course also discusses HVDC faults and protection, reactive power management and elimination of harmonics

Outcome:
- The graduates will be able to design and analyze high voltage DC transmission system for power transmission requirements and can design converter system for the HVDC links.

UNIT – I
Introduction To High Voltage Transmission Systems
Introduction-Historical sketch-Comparison between AC and DC transmission-kinds of DC links – Planning and modern.

UNIT – II
HVDC Converters
Three phase bridge converter-Simplified analysis, wave forms with and without overlap-Current And voltage relations- Input power factor- principles of control-Control characteristics– Constant ignition angle control–Constant current and extinction angle control-HVDC converters – twelve -higher pulse operation-introduction to modern converters

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

UNIT – IV
Reactive Power And Harmonics In HVDC
Sources of reactive power-static VAR system–Reactive power control during transients– eneration of harmonics– Types and design of various AC filters, DC filters–interference- telephone-RI noise.

UNIT – V
Multi Terminal HVDC Systems
Types of MTDC system–Comparison of seriesand parallel MTDC system–HVDC insulation–DC line insulators – DC breakers – Characteristics and types of DC breakers.

Total contact Hours: 60  Total Tutorials:  Total Practical Classes:  Total Hours: 60

Text Books:

Reference Books:
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<td>Course Code</td>
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<tr>
<td>EEP15</td>
<td>POWER SYSTEM RESTRUCTURING AND Deregulation</td>
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Prerequisite:

- To explore the students with the structure of electrical tariff and the impact of depreciation on the power components
- To introduce the architecture of power markets and discusses the technical challenges such as TTC and congestion management in the restructured power market
- To teach the fundamentals of minimizing the cost of generation sources to meet the power system load and a detail study on the current scenario of the Indian power market.

Objectives:

- The graduates will be able to solve the issues available in restructured power system and can address the problems in deregulated power market.

Outcome:

UNIT – I  
Fundamentals Of Power Markets  
Hours: 12

UNIT – II  
Transmission Challenges  
Hours: 12

UNIT – III  
Congestion Management And Ancillary Services  
Hours: 12

UNIT – IV  
Transmission Pricing  
Hours: 12

UNIT – V  
Indian Power Market  
Hours: 12

Total contact Hours: 60  
Total Tutorials:  
Total Practical Classes:  
Total Hours: 60

Text Books:

- Reference Books:

  5. Scholarly Transaction Papers, Utility and Power Exchange web sites.
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<td>EEP16</td>
<td>POWER SYSTEM STABILITY</td>
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**Prerequisite:**
- To give the students basic knowledge about the dynamic mechanisms behind angle and voltage stability problems in electric power systems, including physical phenomena and modeling issues
- To make the students able to analyze and understand the electromagnetic and electromechanical phenomena taking place around the synchronous generator

**Objectives:**
- The graduates will be able to analyze the stability of practical power system networks and can design power system stabilizer for the existing networks.

**Outcome:**
- The graduates will be able to analyze the stability of practical power system networks and can design power system stabilizer for the existing networks.

**UNIT – I**
**Introduction**

**UNIT – II**
**Voltage Stability**
Definition-Power system stability classification- Physical phenomenon of Voltage collapse-Description-Time scales-Reactive power-system changes and Voltage collapse-maintaining variable voltage levels. Transmission System Aspects

**UNIT – III**
**Transmission System Stability**
Single load infinite bus system-Maximum deliverable power-Lossless transmission-Maximum power-Power voltage relationships-Generator reactive power requirement-Instability mechanism. Effect of compensation:-Line series compensation-Shunt compensation-Static VAR compensator-VQ curves-Effect of adjustable transformer ratio.

**UNIT – IV**
**Generation Stability**

**UNIT – V**
**Load Aspects And Power System Stabilizer**

**Text Books:**

**Reference Books:**
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<td>EEP17</td>
<td>SMARTGRID</td>
<td>4</td>
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**Prerequisite:**

- The course aims students to study about smart grid technologies, different smart meters and advanced metering infrastructure
- To make the students familiarize with power quality management and communication protocols for the smart grid applications

**Objectives:**

The graduates will be able to formulate, design and analyze the issues in the implementation of smart grid system.

**UNIT – I**

*Introduction To Smart Grid*  

**UNIT – II**

*Wide Area Monitoring System*  
Fundamentals of synchro phasor technology – concept and benefits of wide area monitoring system–Structure and functions of Phasor Measuring Unit (PMU) and Phasor Data Concentrator (PDC)–Road Map for synchro phasor applications (NAPS)–Operational experience and Blackout analysis using PMU

**UNIT – III**

*Smart Meters*  
Features and functions of smart meters– Functional specification–category of smart meters– AMR and AMI drivers and benefits– AMI protocol– Demand Side Integration–Peak load, Outage and Power Quality management

**UNIT – IV**

*Information And Communication Technology*  
Overview of smart grid communication system– Modulation and communication–Mobile communication–Power line communication– Demodulation techniques- Radio Communication protocol for smart grid

**UNIT – V**

*Smart Grid Applications*  

**Total contact Hours: 60**  
**Total Tutorials:**  
**Total Practical Classes:**  
**Total Hours: 60**

**Text Books:**


2. Smart Grid Primer, Published by Power Grid Corporation of India Limited, September 2013.

**Reference Books:**


**Websites:**

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Department : EEE  
Programme : B.Tech  
Semester :  
Category : TA  

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<td>EEP18</td>
<td>ADVANCED INSULATION SYSTEMS</td>
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<td>4 C</td>
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Prerequisite:

Objectives:
- To give basic knowledge about the insulation materials and breakdown of those materials at power frequency and by harmonics
- To make the students gain wide knowledge about nano composites and its breakdown characteristics

Outcome:
- At the end of this course, Students will be able to understand the importance of insulation systems in the electric field and its electrical breakdown under various circumstances.

**UNIT – I**

**Solid Insulating Systems And Breakdown At Power Frequency**  
Hours: 12

Types of Solid insulating materials –Breakdown of Solid dielectrics: Intrinsic, electromechanical, Thermal breakdown – Breakdown due to treeing and tracking – Partial discharges in solids – Importance of adding fillers – Electrical properties of solid insulating materials with micro fillers, Breakdown under various electric field configurations.

**UNIT – II**

**Breakdown Of Solid Insulating Materials Caused By Harmonics**  
Hours: 12

The voltage waveforms affecting winding insulation – Factors affect motors fed by Adjustable Speed Drives (ASD): Effect of voltage amplitude, PD erosion, polarity, rise time, pulse repetition frequency, duty cycle, PD inception voltage – Breakdown at high frequency high voltages and harmonics – Effect of space charges.

**UNIT – III**

**Condition Monitoring Of Electrical Equipment**  
Hours: 12


**UNIT – IV**

**Introduction To Nano-Composites**  
Hours: 12


**UNIT – V**

**Breakdown Of Nano-Composites**  
Hours: 12


Total contact Hours: 60  
Total Tutorials:  
Total Practical Classes:  
Total Hours: 60

**Text Books:**

**Reference Books:**
1. N.H. Malik, A. A. Al-A rainy and M. I. Qureshi, Electrical Insulation in Power Systems, Marcel Dekker, New York,
1998

Websites:
1. Web Resources from www.ieeexplore.org/deis
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**Prerequisite:**
- To provide basic introduction to the theory of signal processing and the study of DFT and Z transform techniques and its properties.
- The course enables the students to study the design and implementation of digital filters and the finite word length effects in signal processing.

**Objectives:**
- The students will be able to do discrete fourier transform and finite fourier transform analysis for any system.
- They can design digital filters and implement the digital filters for the real world applications.

**Outcome:**

**UNIT – I** Discrete Time Signals And Systems  Hours: 9

**UNIT – II** Discrete Time System Analysis  Hours: 9

**UNIT – III** DFT And FFT  Hours: 9
- Discrete Fourier Transform-properties - relationship between z- transform, DTFT and DFT-Frequency analysis of signal using DFT. FFT algorithms-advantages over discrete computation of DFT –radix2 algorithms-Decimation In Time-Decimation In Frequency-Computation of IDFT using FFT.

**UNIT – IV** Design Of Digital Filters  Hours: 9

**UNIT – V** Filter Implementation And Finite Word Length Effects  Hours: 9

**Total contact Hours: 45**  **Total Tutorials: 15**  **Total Practical Classes: 15**  **Total Hours: 60**

**Text Books:**

**Reference Books:**
Department : EEE  
Programme : B.Tech

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<td>SOLID STATE DRIVES</td>
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Prerequisite:
- This course will make an engineering student to understand the performance of electric drives controlled from power electronic converters
- Under the course, the students will come across characteristics, modeling and selection of motor power rating
- They will have the theory and practical knowledge of the operation and performance of converter and chopper fed dc drives
- The course teaches solid state control of induction motors both from stator side and rotor side and closed loop operation of electric drives and various control techniques.

Objectives:
- The students will be able to formulate, analyze and design DC or AC drive according to the requirements of the practical applications

Outcome:
- The students will be able to formulate, analyze and design DC or AC drive according to the requirements of the practical applications

UNIT – I  
Fundamentals Of Electric Drives  
Hours: 9
Solid State Electric Drives-Merits over other drives, elements, choices; Mechanical characteristics of electrical motors; Components of load torque and mechanical characteristics of different loads; Joint speed – torque characteristics with examples; introduction to industrial applications – rolling mill, textile mill, paper mill etc.  
Modeling of dc drive system – transfer function modeling of dc shunt motor and other system elements; Designing of speed loop and current controllers – analysis with load and voltage changes.

UNIT – II  
Phase Angle Controlled Rectifier DC Drives  
Hours: 9
Constant HP and constant torque operation. Phase Angle controlled rectifier DC Dives –Single phase and three phase full wave half controlled and fully controlled drives – quadrants of operation, waveforms, speed-torque curves, related numerical problems.

UNIT – III  
DC Chopper Drives  
Hours: 9
DC Chopper drives- class A, B, C, D and E chopper drives- quadrants of operation, options in gate pulse pattern, waveforms, speed-torque curves, related numerical problems.

UNIT – IV  
Induction Motor Drives  
Hours: 9
Stator voltage control- principle, closed loop operation, slip-torque characteristics, highlighting the drawbacks with constant torque load, suitability with fan type load. Stator frequency control –principle, slip-torque characteristics, drawbacks. V/f control- principle, slip-torque characteristics.  

UNIT – V  
Synchronous And Special Motor Drives  
Hours: 9
Open loop volts/hertz control, self-control, Marginal angle control and power factor control.
Introduction to special electrical motor drives- elementary treatment to BLDC and SRM drives.

PRACTICE
Five Simulation/hardware experiments to understand the following concepts
- Single and three phase Rectifier DC Drives
- DC Chopper DC Drives
- Stator voltage controlled induction motor drives
- V/f controlled Induction Motor drive
- BLDC Motor drives  
Hours: 30

Total contact Hours: 45  
Total Tutorials:  
Total Practical Classes: 30  
Total Hours: 75

Text Books:
### Reference Books:


### Websites:

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<td>EEG01</td>
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<td>40 60 100</td>
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**Prerequisite:**
- To understand the principle of electromagnetic induction and the working principle of static and rotating electrical machines.
- To explore the students to the construction, principle of operation and performance of special electrical machines

**Objectives:**
- The students will be able to know the principle of operation of DC and AC electrical machines and different types of special machines.

**Outcome:**
- The students will be able to know the principle of operation of DC and AC electrical machines and different types of special machines.

**UNIT – I**
Transformer

**UNIT – II**
D.C. Machines

**UNIT – III**
A.C. Machines

**UNIT – IV**
Special Machines

**UNIT – V**
Utilization

**Total contact Hours:** 60
**Total Tutorials:**
**Total Practical Classes:**
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
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**Prerequisite:**

- To introduce the non conventional optimization techniques such as genetic algorithms, fuzzy logic and neural networks and their applications to solve optimization problems
- To make the student able to solve simple optimization problems using the above solution techniques

**Objectives:**

- The graduates will be having exposure of the application of genetic algorithms, fuzzy logic and neural networks for the solution of nonlinear optimization problems.

**UNIT – I**

**Introduction To Soft Computing**


**UNIT – II**

**Genetic Algorithms**


**UNIT – III**

**Applications Of Genetic Algorithms**


**UNIT – IV**

**Neural Networks**

Introduction to Neural Network, Adaptive Networks – Feed forward Networks, back propagation algorithm, Self Organizing Maps (SOMs).

**UNIT – V**

**Fuzzy Logic**


**Text Books:**

5. Simon Haykin, Neural Networks, Prentice-Hall of India.

**Reference Books:**


**Websites:**
Course Code | Course Name                  | Hours / Week | Credit | Maximum Marks |
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<td>POWER GENERATION SYSTEM</td>
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<td>40 60 60</td>
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**Prerequisite:**
- To become familiar with operation of various power plants such as hydro power generation, thermal power generation, nuclear power generation and all the non-conventional power generation methods.

**Objectives:**
- The students will be knowing the concepts of power generation from various conventional and non-conventional power generation methods and having exposure in the economic operation of power generating stations.

**Outcome:**
- The students will be knowing the concepts of power generation from various conventional and non-conventional power generation methods and having exposure in the economic operation of power generating stations.

**UNIT – I**
Economics Of Generation
Hours: 12
Load and load duration curve – load, demand and diversity factors – plant capacity and plant use factors – choice of type of generation – choice of size and number of units – cost of energy generated – tariffs.

**UNIT – II**
Thermal And Hydro Power Systems
Hours: 12
Comparison of power systems – layout and working of steam, diesel low and high head hydro power plants – pumped storage plants.

**UNIT – III**
Economic Operation Of Steam – Hydro Plants
Hours: 12
- Interconnected operation – division of load in interconnected systems – loss formula coefficients – economic loading of steam power plants and steam hydro power plants.

**UNIT – IV**
Nuclear Power Plants
Hours: 12

**UNIT – V**
Non-Conventional Power Plants
Hours: 12
Basic concepts – principle of working and layout of MHD, solar, wind, tidal, biomass and geothermal power generation.

Total contact Hours: 60
Total Tutorials:  
Total Practical Classes:  
Total Hours: 60

**Text Books:**
1. Arora and Domkundwar, A Course in Power Plant Engineering, Dhanpat Rai and Sons Pvt.Ltd., New Delhi

**Reference Books:**