## PONDICHERY ENGINEERING COLLEGE, PUDUCHERRY – 605 014

### CURRICULUM AND SYLLABI FOR AUTONOMOUS STREAM

#### B.TECH. (ELECTRICAL AND ELECTRONICS ENGINEERING) COURSES
(For students admitted from Academic Year 2014-15 onwards)

### CURRICULUM

#### I SEMESTER

<table>
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<th>Subject</th>
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| Total Credits | 30 |

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| Total        | 32 |

# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks
* TA – Theory Category A, TB – Theory Category B, TC – Theory Category C,
  LB – Laboratory, EGD – Engineering Graphics / Drawing
  POD – Practice Oriented Design, TCP – Theory Combined with Practice, PR - Practice

a Approved in 3rd Academic Council Meeting
### III SEMESTER

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**Total Credits** 28

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**Total Credits** 28

TX® - Theory Course (Category TA/ TB/ TC/TCP)
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Total Credits: 28

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TX° - Theory Course (Category TA/ TB/ TC/TCP)
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**Total Credits** 25

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**Total Credits** 22

TX® - Theory Course (Category TA/ TB/ TC/TCP)
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<td>Avionics</td>
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| Total | 172   | 48    | 220   |
SYLLABUS (Core Subjects)
**Department:** Mathematics  
**Programme:** B.Tech.

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<tr>
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<th>Hours / Week</th>
<th>Credit</th>
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<td>Mathematics I</td>
<td>3 L 1 T -</td>
<td>4 C</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.

**Text Books:**

**Reference Books:**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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<td>PH101</td>
<td>Engineering Physics</td>
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Prerequisite

- 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 and Ultrasonics  Hours: 12


UNIT – II  Optics  Hours: 12


UNIT – III  Crystal Structure and Lattice Defects  Hours: 12

Crystal structure: Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices- Atomic Radius, Coordination 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 and Fiber Optics  Hours: 12


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

Text Books:


Reference Books:

Prerequisite

- 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

Objectives

- 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.

Outcome

UNIT – I
Water Treatment

<table>
<thead>
<tr>
<th>Hours: 12</th>
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UNIT – II
Industrial Polymers

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<th>Hours: 12</th>
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</table>

UNIT – III
Electrochemical Cells

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UNIT – IV
Corrosion and Control

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UNIT – V
Engineering Materials

<table>
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<tr>
<th>Hours: 12</th>
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Total contact Hours: 60  Total Tutorials: -  Total Practical Classes: -  Total Hours: 60

Text Books:

Reference Books:
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<th>Hours / Week</th>
<th>Credit</th>
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<td>BE101</td>
<td>Basic Civil and Mechanical Engineering</td>
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<td>4</td>
<td>40 60 100</td>
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</table>

**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:**
- 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.

**UNIT – I** Buildings and Building Materials

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


**UNIT – III** Basic Infrastructure


**UNIT – IV** IC Engines and Steam Generators

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** Conventional and Non-conventional Power Generation

Power Generation Systems – Conventional and Non-Conventional:

**UNIT – VI** Introduction to Manufacturing Technology

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


Moulding: Pattern making – Green and dry sand moulding – casting. Metal Joining – Arc and Gas welding – Brazing
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<td>1. <a href="http://nptel.iitm.ac.in/courses/Webcourse-contents/">http://nptel.iitm.ac.in/courses/Webcourse-contents/</a></td>
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**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 (Introduction only).
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:**
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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**
- 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

**Outcome**

<table>
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<tr>
<th>UNIT – I</th>
<th>Basic Concepts of Communicative English</th>
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<th>Writing</th>
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<table>
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<th>Oral Communication</th>
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<tr>
<th>UNIT – V</th>
<th>Vocabulary and Language Through Literature</th>
<th>Hours: 12</th>
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| Analysis of
  1. “English in India”, R.K. Narayan
  3. “Politics and the English Language”, George Orwell |

**Total**

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

**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.

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

**Reference Book:**
**Department**: Chemistry  
**Programme**: B.Tech.  
**Semester**: One  
**Category**: LB  

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**Prerequisite**
- 

**Objectives**

- 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.

**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 listed 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.

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

**Text Books:**


**Reference Books:**

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</table>

**Prerequisite**
- 

**Objectives**
- 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.

**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**
  - Study of tools and Machineries
  - Symmetric fitting
  - Acute angle fitting
  - Obtuse angle fitting

**UNIT II**

- **Welding**
  - Study of arc and gas welding equipment and tools
  - Simple lap welding (Arc)
  - Single V butt welding (Arc)
  - Corner joint (Arc)

**UNIT III**

- **Sheet Metal**
  - Study of tools and machineries
  - Funnel
  - Waste collection tray
  - Rectangular Box

**UNIT IV**

- **Carpentry**
  - Study of tools and machineries
  - Half lap joint
  - Corner mortise joint
  - Dovetail joint

**Total contact Hours:** 45  **Text Books:**

**Web sites:**
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<td>Mathematics II</td>
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<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**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

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

**UNIT – I**
Hours: 09
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**
Hours: 09
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**
Hours: 09
Finite differences: Definitions and relation between operators \( \Delta, V, \delta, E, \mu, D \), Solution of difference Equations, Solving Boundary value problems for ordinary differential equations using finite difference method.

**UNIT – IV**
Hours: 09
Gradient, divergence and curl, their properties and relations. Stokes's theorem and Gauss divergence theorem (without proof). Simple applications involving cubes, sphere and rectangular parallelepipeds.

**UNIT – V**
Hours: 09
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>
<thead>
<tr>
<th>Department: Physics</th>
<th>Programme: B.Tech.</th>
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</thead>
<tbody>
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<td>Semester: Two</td>
<td>Category: TA</td>
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<table>
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<tr>
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<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH102</td>
<td>Material Science</td>
<td>L 4</td>
<td>T -</td>
<td>P -</td>
</tr>
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</table>

Prerequisite: 

- 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.

Outcomes: 

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

UNIT – I  Dielectric Materials


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

Smart Materials: Introduction –definitions. 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


Text Books:


Reference Books:

### Subject Code: CY102  
#### Environmental Science

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>L</td>
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<td>P</td>
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<tr>
<td>4</td>
<td>-</td>
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</tbody>
</table>

#### Prerequisite:
- None

#### Objectives:
- To widen 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

#### 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


#### 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,AText Bookof Environmental Chemistry and Pollution Control, S. Chand and Company Ltd, New Delhi, 2008. (Unit II, III, & V)
3. C.N. Sawyer, P.L. McCarty And G.F. Parkin, Chemistry for Environmental Engineering and Science, Tata
Reference Books:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</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 L 1 T -</td>
<td>4 C</td>
<td>40 CA 60 SE 100 TM</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  
Hours: 07


**UNIT – II**  AC Circuits  
Hours: 08

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  
Hours: 08

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  
Hours: 07


**UNIT – V**  Communication  
Hours: 08


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
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
<tr>
<td>ME101</td>
<td>Engineering Thermodynamics</td>
<td>L 3 T 1 P 1</td>
<td>C 4</td>
<td>CA 40 SE 60 TM 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- 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.

**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 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.

**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**


**UNIT – II**

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.

**UNIT – III**


**UNIT – IV**


**UNIT – V**

Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system – Liquefaction – Solidification (only theory).

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

**Text Books:**


Web sites:
1. http://nptel.iitm.ac.in/courses/Webcourse-contents/
### Department: Computer Science and Engineering / Information Technology

**Programme:** B.Tech.

**Semester:** Two

**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tbody>
<tr>
<td>CS101</td>
<td>Computer Programming</td>
<td>L 1 T 1 P 0</td>
<td>C 4</td>
<td>CA 40 SE 60 TM 100</td>
</tr>
</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:**

- 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


**UNIT – IV**

Hours: 09


**UNIT – V**

Hours: 09


**Text Books:**


**Reference Books:**

<table>
<thead>
<tr>
<th>Department</th>
<th>Programme</th>
<th>Semester</th>
<th>Category</th>
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<td>Mechanical Engineering</td>
<td>B.Tech.</td>
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<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>ME102</td>
<td>Engineering Graphics</td>
<td>2 - 3</td>
<td>4</td>
<td>50 - 50 - 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**

- 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

**Objectives:**

- 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.

**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 Points and Projection of lines

**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:**


**Web sites:**

Department: Computer Science and Engineering / Information Technology  
Programme: B.Tech.

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
<tr>
<td>CS102</td>
<td>Computer Programming Laboratory</td>
<td>4</td>
<td>4</td>
<td>40</td>
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</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:
- Study of OS commands
- Use of mail merge in word processor
- Use of spreadsheet to create Charts (XY, Bar, Pie) with necessary formulae.
- Use of Power point to prepare a slide show.

**Cycle - I**

**Fundamentals of Computing**

- Study of OS commands
- Use of mail merge in word processor
- Use of spreadsheet to create Charts (XY, Bar, Pie) with necessary formulae.
- Use of Power point to prepare a slide show.

**Cycle - II**

**Programming Using C**

- Study of Compilation and execution of simple C programs
- Basic C Programs
  - Arithmetic Operations
  - Area and Circumference of a circle
  - Swapping with and without Temporary Variables
- Programs using Branching statements
  - To check the number as Odd or Even
  - Greatest of Three Numbers
  - Counting Vowels
  - Grading based on Student’s Mark
- Programs using Control Structures
  - Computing Factorial of a number
  - Fibonacci Series generation
  - Prime Number Checking
  - Computing Sum of Digit
- Programs using String Operations
  - Palindrome Checking
  - Searching and Sorting Names
- Programs using Arrays
  - Sum of ‘n’ numbers
  - Sorting an Array
  - Matrix Addition, Subtraction, Multiplication and Transpose
- Programs using Functions
  - Computing nCr
  - Factorial using Recursion
  - Call by Value and Call by Reference
- Programs using Structure
  - Student Information System
  - Employee Pay Slip Generation
  - Electricity Bill Generation
- Programs using Pointers
  - Pointer and Array
| b. Pointer to function |
| c. Pointer to Structure |
| 10. Programs using File Operation |
| a. Counting No. of Lines, Characters and Black Spaces |
| b. Content copy from one file to another |
| c. Reading and Writing Data in File |

| Total contact Hours: - | Total Tutorials: - | Total Practical Classes: 45 | Total Hours: 45 |
**Department**: Electronics and Communication Engineering / Electrical and Electronics Engineering  
**Programme**: B.Tech.  
**Semester**: Two  
**Category**: LB

<table>
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<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tbody>
<tr>
<td>BE103</td>
<td>Basic Electrical and Electronics Engineering Laboratory</td>
<td>-</td>
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<td>2</td>
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</table>

**Prerequisite:**
- 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:**
- 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
  2. Study of Fiber Optic Communication.
  4. Zener Diode as Voltage Regulator.
  5. Design of Adder and Subtractor Circuits.

**Total contact Hours:** -  
**Total Tutorials:** -  
**Total Practical Classes:** 45  
**Total Hours:** 45
Department: Mathematics  Programme: B.Tech.
Semester: Three  Category: TB

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<tr>
<td>MA103</td>
<td>Mathematics - III</td>
<td>3 L 1 T 4 P</td>
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<table>
<thead>
<tr>
<th>Prerequisite</th>
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</thead>
<tbody>
<tr>
<td>· To introduce the ideas of Laplace and Fourier Transforms</td>
</tr>
<tr>
<td>· To familiarize students with Complex Analysis</td>
</tr>
<tr>
<td>· To introduce Fourier series.</td>
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<table>
<thead>
<tr>
<th>Objectives</th>
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<tbody>
<tr>
<td>· Understands Transform Calculus</td>
</tr>
<tr>
<td>· Understand Complex Analysis</td>
</tr>
<tr>
<td>· Able to apply Fourier series</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>· Understands Transform Calculus</td>
</tr>
<tr>
<td>· Understand Complex Analysis</td>
</tr>
<tr>
<td>· Able to apply Fourier series</td>
</tr>
</tbody>
</table>

UNIT – I Laplace Transform  Hours: 09

UNIT – II Complex Variable- Analytic Functions  Hours: 09
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 \( w = z+c, cz, z^2, e^z, \sin z, 1/z \) Bilinear transformation. (excluding Schwarz-Christoffel transformation)

UNIT – III Complex Integration  Hours: 09
Complex integration, Cauchy’s Integral theorem, Cauchy’s integral formula and problems, Taylor’s and Laurent’s theorem (without proof) Classification of singularities. Residues and evaluation of residues – Cauchy’s Residue theorem – Contour integration:) Application of residue theorem to real integrals – unit circle and semicircular contour (excluding poles on boundaries)

UNIT – IV Fourier Series  Hours: 09

UNIT – V Fourier Transform  Hours: 09
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:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<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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</tbody>
</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

Operators Overloading and Type Conversions – Inheritance: Extending classes – Pointers- Virtual Functions and Polymorphism – Exception Handling.

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

**Text Books:**


**Reference Books:**

Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE101</td>
<td>Electric Circuit Analysis</td>
<td>3</td>
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</tbody>
</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  
Hours: 9
Review - Loop and Nodal method for DC circuits. Theorems -Thevenin's, Norton's, Superposition, -Compensation - Tellegan’s, Reciprocity, Maximum power transfer theorems - Millman’s theorem– Applications to DC circuits.

UNIT – II  
Circuit Analysis and Network Theorems for AC Circuits  
Hours: 9

UNIT – III  
Three Phase Circuits and Network Topology  
Hours: 9
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  
Hours: 9
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  
Hours: 9

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

Text Books:

Reference Books:

Websites:
### Subject Code: EE102  
**Subject:** Electrical Machines – I  
**Hours / Week:** 3  
**Credit:** 1  
**Maximum Marks:** 4

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<tr>
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<td>Electrical Machines – I</td>
<td>3 1 -</td>
<td>4</td>
<td>40 60 100</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:**
- To make 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:**  
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
-
**Reference Books:**


### Subject Code: EE104  
Subject: Electromagnetic Theory

| 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:**
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<th>Subject Code</th>
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<th>Credit</th>
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<tr>
<td>EE105</td>
<td>Electrical Machines Laboratory –I</td>
<td>-</td>
<td>3</td>
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**Prerequisite**

- 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.

**Objectives**

- 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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<th>Subject Code</th>
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<tr>
<td>CS147</td>
<td>Data Structures and Object Oriented Programming Laboratory</td>
<td>- - 3 2</td>
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### Prerequisite
- To give hands on training on data storage and data manipulation.

### Objectives
- The course enables the students to develop their own codes, skills in debugging, testing and finally validating the programs.

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

#### LIST OF EXPERIMENTS
1. Searching Techniques
2. Sorting Techniques
3. Imp Linked List and doubly linked and its applications
4. Stack and its applications
5. Implement Queue and its applications
6. Binary tree traversal
7. Graph traversal
8. Shortest path algorithms
9. Programs to implement classes and objects with constructors and destructors
10. Programs to implement different types of inheritances like multiple, Multilevel and hybrid
11. Programs to implement virtual functions to demonstrate the use of run time polymorphism
12. Programs to implement Exception handling

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: 45  Total Hours: 45
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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
- Understands PDE
- Gain knowledge on Boundary value problem
- Able to apply 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:
2. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics,

Reference Books:

Websites: -
Department: Electrical and Electronics Engineering

Programme: B.Tech. (EE)

Semester: Four

Category: TA

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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

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).

UNIT – II
Time-Response Analysis


UNIT – III
Frequency Response Analysis


UNIT – IV
Stability of Dynamic Systems


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.

Text Books:


Reference Books:


Websites:

NPTEL video lecture http://nptel.ac.in/courses/108102043/
### Subject Details

**Subject Code:** EE107  
**Subject:** Electrical Machines- II  
**Programme:** B.Tech. (EE)  
**Department:** Electrical and Electronics Engineering  
**Semester:** Four  
**Category:** TA  

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:**  40  
**Total Hours:** 60

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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**


### 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**


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

**Reference Books:**
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:** Four  
**Category:** TA  

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<td>EE108</td>
<td>Electronic Circuits</td>
<td>3 L 1 T - P</td>
<td>4 C</td>
<td>40 CA 60 SE 100 TM</td>
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**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


**Text Books:**

**Reference Books:**

**Websites:**

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Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes:  
Total Hours: 60
Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)  
Semester: Four  
Category: TA  

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<td>EE109</td>
<td>Pulse and Digital Circuits</td>
<td>3 1 -</td>
<td>4 40</td>
<td>60 100</td>
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**Prerequisite**

- To introduce a comprehensive treatment on the design and analysis of combinational and sequential circuits  
- It aims to train the students to build any combinational circuit with logic gates and exclusively using universal gates  
- The course introduces the operation of switching circuits with discrete components like BJT, FET, UJT versions.

**Objectives**

- At the end of the course, the students will be able to model and design any type of digital circuits  
- They can design any combinational or sequential circuit for industrial applications using logic gates and flip flops.

**Outcome**

UNIT – I  
**Linear Wave Shaping Circuits**  
- Linear wave shaping circuits: RC, RL and RLC circuits – Pulse transformer – Steady state switching characteristics of devices– Clipping and clamping circuits–Switching circuits.

UNIT – II  
**Multi-Vibrators and Time Base Circuits**  

UNIT – III  
**Combinational Circuits**  

UNIT – IV  
**Sequential Circuits**  

UNIT – V  
**Design of Sequential Circuits**  

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

**Text Books:**


**Reference Books:**


**Websites:**
**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**

**Induction 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
### Subject: Electronics Laboratory–I

**Subject Code:** EE111  
**Prerequisite:** -  
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Category:** LB  
**Semester:** Four  
**Credit:** 3  
**Hours / Week:** C  
**Maximum Marks:** 60  
**Total Hours:** 45

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<th>Objective</th>
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<tr>
<td><strong>Objectives</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>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.</td>
</tr>
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</table>

**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 clamps.
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.
Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

Semester: Four  
Category: TB

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<td>EE112</td>
<td>Measurements and Instrumentation</td>
<td>L T P C CA SE 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.

Outcome

- 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:

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<th>Programme : B.TECH</th>
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<td>EE113</td>
<td>TRANSMISSION AND DISTRIBUTION</td>
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<td>Prerequisite: Electric Circuit Analysis</td>
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| **Objective:** | 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. |

**UNIT – I**  
**Distribution Systems**  
Structure of electric power systems—one Line Diagram-generation, transmission and distribution Systems-comparison of distribution systems—radial and ring—two wire dc, ac single phase and three phase systems—current and voltage calculations in distributors with concentrated and Distributed loads – Kelvin’s law for the design of feeders and its limitations.  
**Hours: 9**

**UNIT – II**  
**Transmission Line Parameters**  
Resistance, inductance and capacitance of single and three phase transmission lines-symmetrical and unsymmetrical spacing—transposition-single and double circuits-stranded and bundled conductors-application of self and mutual GMD–Skin and Proximity effect-inductive interference–Corona-characteristics.  
**Hours: 9**

**UNIT – III**  
**Performance of Transmission Lines**  
Development of equivalent circuits for short, medium and long lines—efficiency and regulation-Attenuation constant and phase constant- surge impedance loading—power circle diagrams for sending and receiving ends-transmission capacity, steady state stability limit–voltage control of lines –shunt and series compensation.  
**Hours: 9**

**UNIT – IV**  
**Insulators and Cables**  
Insulators—types and comparison—voltage distribution in string insulator—string efficiency—Methods of improving string efficiency—Stress and sag calculations—effect of wind and ice— supports at different levels—stinging chart-cables—types—capacitance of cables—insulation resistance - dielectric stress and grading- dielectric loss- thermal characteristics- capacitance of three core cables.  
**Hours: 9**

**UNIT – V**  
**Recent Trends in Transmission**  
Design of rural distribution, planning and design of town electrification schemes—comparison of EHVC & HVDC system—economic distance for HVDC—terminal equipment for HVDC systems—description of DC transmission system—planning-advantages-interconnection of HVDC & AC systems—Introduction to FACTS devices – TCR and TSC.  
**Hours: 9**

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

**Text Books:**  

**Reference Books:**  
### Programme: B.Tech. (EE)

#### Department: Electrical and Electronics Engineering  

#### Semester: Five  

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<td>Analog and Digital Integrated Circuits</td>
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#### 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**  

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

### UNIT – II  

**Operational Amplifiers**  

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**  


### UNIT – IV  

**Active Filters and Waveform Generator**  

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**  


**Text Books:**


**Reference Books:**


**Websites:**

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50
EE115  Electrical Machine Design  3  1  -  4  40  60  100

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

Outcome

- 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.

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:
<table>
<thead>
<tr>
<th>Department: Electrical and Electronics Engineering</th>
<th>Programme: B.Tech. (EE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester: Five</td>
<td>Category: TA</td>
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<tr>
<td>Subject Code</td>
<td>Subject</td>
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<td>---------------</td>
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</tr>
<tr>
<td>EE116</td>
<td>Power Electronics</td>
</tr>
<tr>
<td>Prerequisite</td>
<td>Should have through knowledge and completed the basic courses on electrical circuits analysis and electron devices and circuits</td>
</tr>
</tbody>
</table>

### 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**

<table>
<thead>
<tr>
<th>Hours: 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

#### UNIT – II
**Controlled Rectifiers**

<table>
<thead>
<tr>
<th>Hours: 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

#### UNIT – III
**Choppers**

<table>
<thead>
<tr>
<th>Hours: 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

#### UNIT – IV
**Inverters**

<table>
<thead>
<tr>
<th>Hours: 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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

### Text Books:

### Reference Books:
### Subject Code: EE117
### Subject: Measurements and Control Laboratory

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
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<tbody>
<tr>
<td>L</td>
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<td>P</td>
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<td>-</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Prerequisite
- None

#### Objectives
- 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.

#### Outcome
- 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.

#### 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
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
Unit – I

Power System Components Modeling

- 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-Seidel, 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.

Unit – II

Load Flow Analysis

- 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.

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-Formation 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 – III

Symmetrical Components

Definition-Introduction-Review of symmetrical components-Transformation matrices used in resolution of unbalanced voltages and currents- Positive, Negative and Zero sequence networks of power system components like synchronous machines, induction machines, transformers, transmission lines, loads.

Unit – IV

Symmetrical and Unsymmetrical Fault Analysis


Unit – V

Stability Analysis

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.

Text Books:

Reference Books:
Department: Electrical and Electronics Engineering
Programme: B.Tech. (EE)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>EE120</td>
<td>Microprocessors and Microcontrollers</td>
<td>L 1 T 1 P 0 C 4</td>
<td>CA 40 SE 60 TM 100</td>
</tr>
</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.

**Objectives**

- 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-vectorized 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


**Text Books:**


**Reference Books:**

Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

<table>
<thead>
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<td>Subject Code</td>
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<td>EE121</td>
<td>Energy Engineering</td>
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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.

Outcome

- 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**  
Hours: 12
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.

UNIT – III  
**Hydro and Ocean Energy Electric Technologies**  
Hours: 12
Hydro Electric plants – Types, energy conversion schemes, power equation, environmental aspects– Hydro-Thermal coordination-Ocean Energy Technology- Power plant-limitations.

UNIT – IV  
**Wind, Solar Energy and DG Technologies**  
Hours: 12
Wind turbine types and construction- wind energy conversion systems- grid connection- environmental aspects.
Solar energy basics- Solar PV plant- Distributed Generation- Impacts- Benefits.

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:
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:** Six  
**Category:** LB

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<th>Maximum Marks</th>
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<tr>
<td>EE122</td>
<td>Electronics Laboratory-III</td>
<td>-  -  3  2</td>
<td>60</td>
<td>40 100</td>
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</table>

| Prerequisite | -                |

**Objectives**
- 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.

**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 OPAMP 741.
4. Design of analogue integrator and differentiator circuit using OPAMP 741.
5. Design of log and antilog amplifier using OPAMP 741.
8. Design of filter circuits (I order and II order) using OPAMP 741.
9. Design of comparator circuits (PWM and SPWM) and Schmitt trigger circuit using OPAMP 741.
10. Digital to analogue converters using OPAMP 741.
11. Design of Monostable and Astable multivibrator using IC 555.
12. Design of ring counter and Johnson counters.

**Total contact Hours:** -  
**Total Tutorials:** -  
**Total Practical Classes:** 45  
**Total Hours:** 45
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:** Six  
**Category:** LB

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<tbody>
<tr>
<td>EE123</td>
<td>Microprocessors and Microcontrollers Laboratory</td>
<td>-</td>
<td>3</td>
<td>60</td>
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</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
**Subject Code**: EE124  
**Subject**: Power Electronics Laboratory  
**Hours / Week**: L - , T - , P - , 3 - , C - , 2 -  
**Credit**: C -  
**Maximum Marks**: CA - 60 , SE - 40 , TM - 100

**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
Department: Humanities and Social Sciences  
Programme: B. Tech. (EE)  
Semester: Six  
Category: PR

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<td>HS102</td>
<td>General Proficiency</td>
<td>- 3 1 100 100</td>
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</table>

**Prerequisite**

- To enhance the students’ communication and language skills and make them industry-ready.
- To encourage brain storming discussions and team work.
- To train students to master soft skills through various activities.

**Objectives**

- To enhance the students’ communication and language skills and make them industry-ready.
- To encourage brain storming discussions and team work.
- To train students to master soft skills through various activities.

**Outcomes**

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

- Communicate in English effectively and confidently.
- Imbibe the requisite soft skills.
- Improve critical thinking and analytical skills.

**Art of communication:** Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language (Proxemics, kinesics, haptic, chronemics and paralanguage) – Effective Listening – Feedback – presentation skills.

**Introduction to soft skills:** Self-Confidence – Leadership Qualities – Emotional Quotient – Time Management – Stress Management – Interpersonal Skills.

**Comprehension and Analysis:** British and American English – GRE based comprehension – analytical writing – analyzing contemporary issues – current English usage.

**Adapting to corporate life:** Group discussions – meetings – Public Speaking – Debate – Intercultural communication – etiquettes –interviews-email writing.

**Aptitude:** Vocabulary building - Verbal and Numerical aptitude.

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

**Reference Books:**


**Websites:**

1. www.cambridgeenglish.org
Websites:  

Subject Code | Subject                  | Hours / Week | Credit | Maximum Marks |
-------------|--------------------------|--------------|--------|---------------|
EE125        | Power System Operation and Control | 3 1 -        | 4      | 40 60 100     |

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

Objective

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

UNIT – I

Security Concepts

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

UNIT – II

Load Forecast and Unit commitment

- Load and load duration curves; Load forecasting, components of system load, classification of Base load, forecasting of the base load by method of least square fit-Introduction to unit commitments constraints on unit commitment, unit commitment using priority list method and dynamic programming method. Introduction to Profit based Unit commitment

UNIT – III

Active Power Control

- Power control mechanism of individual machine- mathematical model of speed governing Mechanism- speed load characteristics of governing mechanism-Regulation of two generator sin parallel- Division of power system into control areas-LFC control of a single area; static and dynamic analysis of uncontrolled system- proportional plus integral control of a single area- LFC control of two area system-uncontrolled case, static and dynamic response-Tie line with frequency bias control of two area.

UNIT – IV

Dispatch Schedule

- Incremental cost curve- co-ordination equations with losses neglected- solution by iteration- co-ordination equations with loss included (No derivation of Bac, co-efficient) solution of co-ordination equations using Bac co-efficient by iteration method, Base point and participation factors. Emission dispatch – Combined Economic and Emission Dispatch- Price balance penalty factor- Emission constrained economic dispatch.

UNIT – V

Voltage Control

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

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

Text Books:


Reference Books:


Websites:
<table>
<thead>
<tr>
<th>Department: Electrical and Electronics Engineering</th>
<th>Programme: B.Tech.</th>
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<td>Semester: Seven</td>
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<th>Subject Code</th>
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<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE126</td>
<td>Protection and Switchgear</td>
<td>3</td>
<td>4</td>
<td>40</td>
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</tbody>
</table>

**Prerequisite**
- To introduce the power system protection and the working of relays
- To enable the students to understand the types of relays that are application specific, design of protection equipment for each power system component based on the performance metrics like generator capability curve and fault calculations, study the types of circuit breakers and fuses and their construction.

**Outcome**
- The graduates will be able to formulate design and analyze any power system protection network for practical requirements.

**UNIT – I Introduction and General Philosophies**
- Hours: 9

**UNIT – II Relay Fundamentals and Characteristics**
- Hours: 9
  - 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**
- Hours: 9

**UNIT – IV Design Aspects of Circuit Breakers**
- Hours: 9

**UNIT – V Circuit Breakers**
- Hours: 9

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

**Text Books:**

**Reference Books:**
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:** Seven  
**Category:** LB  

<table>
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<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tbody>
<tr>
<td>EE127</td>
<td>Power System Laboratory</td>
<td>-</td>
<td>3</td>
<td>60 40 100</td>
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</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.
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>
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<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE128</td>
<td>Project Work (Phase I)</td>
<td>-</td>
<td>3</td>
<td>60 40 100</td>
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</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.
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EE129</td>
<td>Professional Ethics and Practice</td>
<td>L T P C CA SE TM</td>
<td>100 100</td>
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</table>

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.

Text Books:


Reference Books:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE130</td>
<td>Comprehensive Test and Viva-Voce</td>
<td>-</td>
<td>-</td>
<td>60</td>
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</table>

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

**Objectives**
- 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.

**Outcome**
- 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
<table>
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<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EE131</td>
<td>Project Work (Phase II)</td>
<td>-</td>
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</table>

**Prerequisite**
- The objective of the projects is to enable the 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.

**Outcome**

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 set up. 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. Team that has come out with novel contribution will be encouraged to publish their work in any referred journals.

**Websites:**
SYLLABUS (Elective Subjects)
Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>EEP01</td>
<td>Renewable Energy Sources</td>
<td>4</td>
<td>4</td>
<td>40 60 100</td>
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</tbody>
</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**


**UNIT – II**

**Solar Energy and Applications**

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**


**UNIT – IV**

**Ocean & Tidal Energy**

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**

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

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

**Text Books:**


**Reference Books:**


**Websites:**
<table>
<thead>
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<th>Department: Electrical and Electronics Engineering</th>
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<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EEP02</td>
<td>Fuzzy and Neural Systems</td>
<td>4</td>
<td>4</td>
<td>40 60 100</td>
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</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

Outcome

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

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

Text Books:

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

Websites:
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)

**Semester:**  
**Category:** TA

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<td>EEP03</td>
<td>Utilization of Electrical Energy</td>
<td>4 - - -</td>
<td>4</td>
<td>40 60 100</td>
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</table>

**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**

**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


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

**Text Books:**


**Reference Books:**

Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

Semester :  
Category : TA

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<td>EEP04</td>
<td>Power Quality</td>
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</table>

Prerequisite

Objectives

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

Outcome

- 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.

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. McGranagh, Surya Santoso, H.Wayne Beaty, Electrical Power Systems Quality, McGraw Hill,2003.(For Chapters1,2,3, 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:
### Refrence Books:


### Text Books:


### Websites:

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<td>EEP06</td>
<td>Modern Control Systems</td>
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</table>

**Prerequisite**

**Objectives**

- 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

**Outcome**

- 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  

**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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Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EE)

<table>
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<td>EEP07</td>
<td>Electrical Safety and Quality Management</td>
<td>4 - -  4</td>
<td>40 60 100</td>
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</table>

**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.

**Outcome**

UNIT – I  
Review of IE Rules and Acts and Their Significance  
Hours: 12

Objective and scope– ground clearances and section clearances– standards on electrical safety- safe limits of current, voltage–earthing of system neutral –Rules regarding first aid and fire fighting facility.

UNIT – II  
Electrical Safety in Residential, Commercial and Agricultural Installations  
Hours: 12


UNIT – III  
Safety During Installation, Testing and Commissioning, Operation and Maintenance  
Hours: 12


UNIT – IV  
Electrical Safety in Hazardous Areas  
Hours: 12

Hazardous zones–class0,1 and 2– spark, flashovers and corona discharge and functional requirements– Specifications of electrical plants, equipments for hazardous locations– Classification of equipment enclosure for various hazardous gases and vapours– classification of equipment/enclosure for hazardous locations.

UNIT – V  
Quality Management  
Hours: 12


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

**Text Books:**

<table>
<thead>
<tr>
<th>Department: Electrical and Electronics Engineering</th>
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<tr>
<td>EEP08</td>
<td>Special Electrical Machines</td>
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</table>

### 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.

### Outcome
- To study and understand the working and performance of special electrical machines.
- To explore and understand the working and performance of fractional HP machines, switched reluctance motor, PMSM, PMBL DC motors and stepper motors.

### UNIT – I
**Single Phase Machines**
- Hours: 12

### 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.
- Hours: 12

### 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.
- Hours: 12

### UNIT – IV
**Permanent Magnet Brush Less DC Motors**
- Hours: 12

### UNIT – V
**Permanent Magnet Synchronous Motors**
- Hours: 12

### Total contact Hours: 60
### Total Tutorials: 12
### Total Practical Classes: 48
### Total Hours: 60

### Text Books:

### Reference Books:
1. A. Hughes, Electric Motors and Drives, Affiliated East-West Press Pvt., Ltd., 2007
2. R.Krishnan, Electric Motor Drives Modeling, Analysis, and Control, Prentice Hall of India

### Websites:
-
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:**  
**Category:** TB  

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<td>EEP09</td>
<td>Digital System Design Using VHDL</td>
<td>4</td>
<td>4</td>
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</table>

**Prerequisite:** -

**Objectives**
- 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

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

**UNIT – I**  
**Implementation Technology**  
**Hours:** 12
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**  
**Hours:** 12

**UNIT – III**  
** VHDL Programming**  
**Hours:** 12
Subprograms and Packages – Predefined Attributes – Configurations – VHDL Synthesis – constraints and attributes.

**UNIT – IV**  
** Combinational Circuit Design**  
**Hours:** 12

**UNIT – V**  
** Sequential Circuits**  
**Hours:** 12
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:**
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:**  
**Category:** TA  

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<tr>
<td>EEP10</td>
<td>High Voltage Engineering</td>
<td>4 -</td>
<td>4</td>
<td>40 60 100</td>
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</tbody>
</table>

**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.

**Objectives:**  
- At the end of the course, the students will be able to conduct various high voltage tests for different electrical equipments.

**Outcome:**

**UNIT – I**  
**Over Voltages and Insulation Coordination**  
Hours: 12  
Causes of over voltages-lightning and switching over voltages- protection against over voltages-principles of insulation coordination.

**UNIT – II**  
**Generation of High Voltages and High Currents**  
Hours: 12  

**UNIT – III**  
**Measurement of High Voltages and High Currents**  
Hours: 12  
Measurement of AC,DC impulse and switching surges using sphere gaps, peak voltmeters, potential dividers and high speed CRO, op to Electronics method; Fiber optic method;

**UNIT – IV**  
**Electrical Breakdown in Gases, Solids and Liquids**  
Hours: 12  
Ionization processes- Town send &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.

**UNIT – V**  
**High Voltage Testing Practice**  
Hours: 12  
Indian Standards/IEC specification for testing, correction factor-high voltage testing of power Apparatus-Insulators, Bushings, Isolators, Circuit Breakers, Cables, Transformers and Surge Diverters.

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

**Text Books:**  

**Reference Books:**  
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:**  
**Subject Code** | **Subject** | **Hours / Week** | **Credit** | **Maximum Marks**  
--- | --- | --- | --- | ---  
EEP11 | Power System Economics | | |  
| | | |  
**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**  
- The graduates will be able to do economic dispatch and optimal power flow for practical power system test data.  

**UNIT – I**  
**Economic Considerations**  
Cost of electrical energy – Expressions for cost of electrical energy–Capital-interest– Depreciation- Different methods- Factors affecting cost of operation- Number and size of generating units- Importance of high load factor- Importance of power factor improvement- Most economical power factor- Meeting the KW demand on power stations- Power system tariffs – Regions and structure of Indian Power System.  
**UNIT – II**  
**Economic Dispatch**  
**UNIT – III**  
**Economic Operation**  
**UNIT – IV**  
**Economic Control**  
**UNIT – V**  
**Optimal Power Flow And Fundamentals Of Markets**  
**Total contact Hours:** 60  
**Total Tutorials:**  
**Total Practical Classes:**  
**Total Hours:** 60  
**Text Books:**  
**Reference Books:**  
**Websites:**  
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### Department: Electrical and Electronics Engineering  
### Programme: B.Tech. (EE)

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#### Subject Code | Subject | Hours / Week | Credit | Maximum Marks |
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<tr>
<td>EEP12</td>
<td>Digital Control System</td>
<td>4</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.

<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>Introduction</th>
<th>Hours: 12</th>
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</table>
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.

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<th>State Variable Technique</th>
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<th>Controllability, Observability And Stability</th>
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<th>Controller Design (Classical Approach)</th>
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<th>UNIT – V</th>
<th>Controller Design (State Space Approach)</th>
<th>Hours: 12</th>
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#### Text Books:

#### Reference Books:

#### Websites:

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<tr>
<td>EEP13</td>
<td>Embedded System Design</td>
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</tbody>
</table>

**Prerequisite:**

**Objectives:**
- 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.

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

**UNIT – I**

**Introduction To Embedded System**

**Hours:** 12

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

**UNIT – II**

**Processor And Memory Organization**

**Hours:** 12

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.

**UNIT – III**

**Devices & Buses For Devices Network**

**Hours:** 12

I/O devices—timer & counting devices—serial communication using I²C, CAN, USB buses—Parallel communication using ISA, PCI,PCI/X buses, arm bus—interfacing with devices/ports, device drivers in a system—Serial port & parallel port.

**UNIT – IV**

**I/O Programming Schedule Mechanism**

**Hours:** 12

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.

**UNIT – V**

**Real Time Operating System (RTOS)**

**Hours:** 12

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

**Text Books:**

**Reference Books:**
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
<tr>
<td>EEP14</td>
<td>HVDC Transmission</td>
<td>4</td>
<td>4</td>
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</table>

**Prerequisite:** EEP14

**Semester:**  
**Department:** Electrical and Electronics Engineering

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<tr>
<th>Subject Code</th>
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</table>

**Objectives**
- To introduce HVDC transmission systems and the features of HVDC and EHVAC 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  
**Hours:** 12

Introduction-Historical sketch-Comparison between AC and DC transmission-kinds of DC links – Planning and modern.

**UNIT – II**  
HVDC Converters  
**Hours:** 12

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  
**Hours:** 12

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  
**Hours:** 12

Sources of reactive power-static VAR system–Reactive power control during transients– generation of harmonics– Types and design of various AC filters, DC filters–interference- telephone-RI noise.

**UNIT – V**  
Multi Terminal HVdc Systems  
**Hours:** 12

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:**
1. K.R.Padiyar, HVDC Power Transmission Systems Technology and System Interactions,

**Reference Books:**
3. Mohan, Undeland and Robbins, Power Electronics Converters, Applications and Design,
Programme: B.Tech. (EE)

Department: Electrical and Electronics Engineering

Semester: TA

Subject Code: EEP15  
Subject: Power System Restructuring and Deregulation

<table>
<thead>
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<th>Hours / Week</th>
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Prerequisite:

Objectives:

- 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.

Outcome:

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

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.
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EEP16</td>
<td>Power System Stability</td>
<td>4</td>
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<td>40</td>
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</table>

**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.

**UNIT – I**  
**Introduction**  
Hours: 12

**UNIT – II**  
**Voltage Stability**  
Hours: 12
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**  
Hours: 12
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**  
Hours: 12

**UNIT – V**  
**Load Aspects And Power System Stabilizer**  
Hours: 12
Voltage dependence of loads - Load characteristics-Exponential load-Polynomial load-Saddle node bifurcation-Simple power system example (Static and Dynamic). Static voltage stability methods- Continuation power flow methods-P-V analysis - Modal analysis - Simple power system example - State matrix including PSS - Small Signal Stability of Multi Machine Systems Special Techniques for analysis of very large systems - Analysis of Essentially Spontaneous oscillations in Power Systems (AESOPS) algorithms - Modified Arnoldi Method (MAM).

**Text Books:**

**Reference Books:**
<table>
<thead>
<tr>
<th>Department: Electrical and Electronics Engineering</th>
<th>Programme: B.Tech. (EE)</th>
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<tbody>
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<td>Semester:</td>
<td>Category: TA</td>
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<tr>
<td>Subject Code</td>
<td>Subject</td>
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<tr>
<td>EEP17</td>
<td>Smart Grid</td>
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</table>

Prerequisite

- The course aims to 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.

Outcome

UNIT – I  Introduction To Smart Grid  Hours: 12
Evolution of Electric Grid—Need for smart grid—Difference between conventional & smart grid—Overview of enabling technologies—International experience in smart grid deployment efforts—Smart grid road map for INDIA—smart grid architecture

UNIT – II   Wide Area Monitoring System  Hours: 12
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 (NAPSI)—Operational experience and Blackout analysis using PMU

UNIT – III  Smart Meters  Hours: 12
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  Hours: 12
Overview of smart grid communication system—Modulation and Demodulation techniques—Radio communication—Mobile communication—Power line communication—Optical fibre communication—Communication protocol for smart grid

UNIT – V  Smart Grid Applications  Hours: 12

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:
**EEP18**  
Advanced Insulation Systems  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
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| Total Contact Hours: 60 | Total Tutorials: | Total Practical Classes: | Total Hours: 60 |

### Prerequisite

- 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

### Objectives

- 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.

### Outcome

- 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

### 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**


### Text Books:


### Reference Books:


### Websites:

1. Web Resources from www.ieeeexplore.org/deis
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tbody>
<tr>
<td>EEP19</td>
<td>Digital Signal Processing</td>
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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**

**Outcome:**
- 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.

**UNIT – I**
**Discrete Time Signals And Systems**

**UNIT – II**
**Discrete Time System Analysis**

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

**UNIT – IV**
**Design Of Digital Filters**
FIR filter design-linear phase FIR filters-Fourier series method-windowing techniques–frequency Sampling techniques. IIR filter design-analog filter design-Butterworth and Chebyshev approximations-digital filter design using impulse invariant technique and bilinear transformation method -warping, pre warping-Frequency transformation.

**UNIT – V**
**Filter Implementation And Finite Word Length Effects**

**Text Books:**

**Reference Books:**
**Department:** Electrical and Electronics Engineering  
**Programme:** B.Tech. (EE)  
**Semester:** TCP  
**Category:**  
**Subject Code:** EEP20  
**Subject:** Solid State Drives  
**Hours / Week:** 3  
**Credit:** 4  
**Maximum Marks:** 100

<table>
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<tr>
<th>Prerequisite</th>
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| - 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. |

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<thead>
<tr>
<th>Objectives</th>
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<tr>
<td>- The students will be able to formulate, analyze and design DC or AC drive according to the requirements of the practical applications</td>
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<table>
<thead>
<tr>
<th>UNIT – I</th>
<th>Fundamentals Of Electric Drives</th>
<th>Hours: 9</th>
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</thead>
<tbody>
<tr>
<td>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.</td>
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<tr>
<th>UNIT – II</th>
<th>Phase Angle Controlled Rectifier Dc Drives</th>
<th>Hours: 9</th>
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</thead>
<tbody>
<tr>
<td>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.</td>
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<tr>
<th>UNIT – III</th>
<th>DC Chopper Drives</th>
<th>Hours: 9</th>
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<tbody>
<tr>
<td>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.</td>
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<tr>
<th>UNIT – IV</th>
<th>Induction Motor Drives</th>
<th>Hours: 9</th>
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</thead>
</table>
| 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.  

<table>
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<tr>
<th>UNIT – V</th>
<th>Synchronous And Special Motor Drives</th>
<th>Hours: 9</th>
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</table>
| 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. |

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<th>PRACTICE</th>
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</table>
| 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 |

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<th>Text Books:</th>
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<th>Reference Books:</th>
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Websites:
EEG01 Electrical Machines and Utilization

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.

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

Text Books:
Department: Electrical and Electronics Engineering
Programme: B.Tech.

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<tr>
<th>Subject Code</th>
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<th>Hours / Week</th>
<th>Credit</th>
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<tr>
<td>EEG02</td>
<td>Soft Computing Techniques</td>
<td>4</td>
<td>4</td>
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Prerequisite

Objectives

- 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

Outcome

- 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


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

Text Books:

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

Reference Books:


Websites:
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<tr>
<th>Subject Code</th>
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<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>EEG03</td>
<td>Power Generation System</td>
<td>4</td>
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<td>40 60 60</td>
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Prerequisite

Objectives

- 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.

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:


Websites: