ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
III SEMESTER CURRICULUM & SYLLABI

SEASON III

<table>
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<tr>
<th>S.NO.</th>
<th>COURSE CODE</th>
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<tr>
<td>1.</td>
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<td>Transforms and Partial Differential Equations</td>
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<td>Power Plant Engineering</td>
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**PRACTICALS**

| 7.    | EC8311      | Electronics Laboratory                         | ES       | 4              | 0 | 0 | 4 | 2 |
| 8.    | EE8311      | Electrical Machines Laboratory - I              | PC       | 4              | 0 | 0 | 4 | 2 |

**TOTAL** 30 16 6 8 23
OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange’s linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS
Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS

TOTAL : 60 PERIODS

OUTCOMES:

Upon successful completion of the course, students should be able to:

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
• Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
• Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
• Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

REFERENCES:

EE8351 DIGITAL LOGIC CIRCUITS

OBJECTIVES:
• To study various number systems and simplify the logical expressions using Boolean functions
• To study combinational circuits
• To design various synchronous and asynchronous circuits.
• To introduce asynchronous sequential circuits and PLDs
• To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 6+6
Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families -operation, characteristics of digital logic family.

UNIT II COMBINATIONAL CIRCUITS 6+6
Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders,
subtractors, Encoders and Decoders.

UNIT III  SYNCHRONOUS SEQUENTIAL CIRCUITS  6+6
Sequential logic- SR, JK, D and T flip flops - level triggering and edge triggering - counters - asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronous sequential circuits – Moore and Melay models- Counters, state diagram; state reduction; state assignment.

UNIT IV  ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABILITY LOGIC DEVICES  6+6
Asynchronous sequential logic circuits-Transition tability, flow tability-race conditions, hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits-introduction to Programmability Logic Devices: PROM – PLA –PAL, CPLD-FPGA.

UNIT V  VHDL  6+6

TOTAL : 60 PERIODS

OUTCOMES:

- Ability to design combinational and sequential Circuits.
- Ability to simulate using software package.
- Ability to study various number systems and simplify the logical expressions using Boolean functions
- Ability to design various synchronous and asynchronous circuits.
- Ability to introduce asynchronous sequential circuits and PLDs
- Ability to introduce digital simulation for development of application oriented logic circuits.

TEXT BOOKS:

REFERENCES
OBJECTIVES:

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of
  - Electrostatic fields, electrical potential, energy density and their applications.
  - Magneto static fields, magnetic flux density, vector potential and its applications.
  - Different methods of emf generation and Maxwell’s equations
  - Electromagnetic waves and characterizing parameters

UNIT I  ELECTROSTATICS – I  6+6
Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient, Divergence, Curl – theorems and applications - Coulomb’s Law – Electric field intensity – Field due to discrete and continuous charges – Gauss’s law and applications.

UNIT II  ELECTROSTATICS – II  6+6
Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson’s and Laplace’s equations, Capacitance, Energy density, Applications.

UNIT III  MAGNETOSTATICS  6+6
Lorentz force, magnetic field intensity (H) – Biot–Savart’s Law - Ampere’s Circuit Law – H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson’s Equation, Magnetic force, Torque, Inductance, Energy density, Applications.

UNIT IV  ELECTRODYNAMIC FIELDS  6+6

UNIT V  ELECTROMAGNETIC WAVES  6+6
Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors- skin depth - Poynting vector – Plane wave reflection and refraction.

OUTCOMES:

- Ability to understand the basic mathematical concepts related to electromagnetic vector fields.
- Ability to understand the basic concepts about electrostatic fields, electrical potential, energy density and their applications.
- Ability to acquire the knowledge in magneto static fields, magnetic flux density, vector potential and its applications.
- Ability to understand the different methods of emf generation and Maxwell’s equations
- Ability to understand the basic concepts electromagnetic waves and characterizing parameters
- Ability to understand and compute Electromagnetic fields and apply them for design and analysis of electrical equipment and systems

TEXT BOOKS:
EE8301 ELECTRICAL MACHINES – I

OBJECTIVES:
To impart knowledge on the following Topics
• Magnetic-circuit analysis and introduce magnetic materials
• Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.
• Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
• Working principles of DC machines as Generator types, determination of their no-load/load characteristics, starting and methods of speed control of motors.
• Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

UNIT II TRANSFORMERS 6+6
tap changing transformers- tertiary winding.

UNIT III  ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS  6+6
IN ROTATING MACHINES
Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV  DC GENERATORS  6+6

UNIT V  DC MOTORS  6+6
Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors-starting and speed control of DC motors –Plugging, dynamic and regenerative braking-testing and efficiency – Retardation test- Swinburne’s test and Hopkinson’s test - Permanent Magnet DC (PMDC)motors-applications of DC Motor

OUTCOMES:
• Ability to analyze the magnetic-circuits.
• Ability to acquire the knowledge in constructional details of transformers.
• Ability to understand the concepts of electromechanical energy conversion.
• Ability to acquire the knowledge in working principles of DC Generator.
• Ability to acquire the knowledge in working principles of DC Motor
• Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

REFERENCES
OBJECTIVES:
The student should be made to:
- Understand the structure of basic electronic devices.
- Be exposed to active and passive circuit elements.
- Familiarize the operation and applications of transistor like BJT and FET.
- Explore the characteristics of amplifier gain and frequency response.
- Learn the required functionality of positive and negative feedback systems.

UNIT I  PN JUNCTION DEVICES

UNIT II  TRANSISTORS AND THYRISTORS
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristors and IGBT - Structure and characteristics.

UNIT III  AMPLIFIERS
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.

UNIT IV  MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).

UNIT V  FEEDBACK AMPLIFIERS AND OSCILLATORS

OUTCOMES:
Upon Completion of the course, the students will be ability to:
- Explain the structure and working operation of basic electronic devices.
- Able to identify and differentiate both active and passive elements
- Analyze the characteristics of different electronic devices such as diodes and transistors
- Choose and adapt the required components to construct an amplifier circuit.
- Employ the acquired knowledge in design and analysis of oscillators

TEXT BOOKS:
REFERENCES:

ME8792  POWER PLANT ENGINEERING  L  T  P  C
3  0  0  3

OBJECTIVES:
• Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I  COAL BASED THERMAL POWER PLANTS  9

UNIT II  DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS  9

UNIT III  NUCLEAR POWER PLANTS  9

UNIT IV  POWER FROM RENEWABLE ENERGY  9
Hydro Electric Power Plants – Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V  ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS  9
Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL : 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Discuss different power generation methods and boilers and estimate load curves and load duration curves.
CO2  Explain the layout, construction and working of the components inside a thermal power plant.

CO3  Explain the layout, construction and working of the components inside nuclear and hydro electric power plants.

CO4  Explain the layout, construction and working of the components inside diesel and gas turbine power plants.

CO5  Explain the applications of renewable energy on power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

TEXT BOOK:

REFERENCES:

EC8311       ELECTRONICS LABORATORY             L   T   P   C
             0   0   4   2

OBJECTIVES:
• To enable the students to understand the behavior of semiconductor device based on experimentation.

LIST OF EXPERIMENTS
1. Characteristics of Semiconductor diode and Zener diode
2. Characteristics of a NPN Transistor under common emitter, common collector and common base configurations
3. Characteristics of JFET and draw the equivalent circuit
4. Characteristics of UJT and generation of saw tooth waveforms
5. Design and Frequency response characteristics of a Common Emitter amplifier
6. Characteristics of photo diode & photo transistor, Study of light activated relay circuit
7. Design and testing of RC phase shift and LC oscillators
8. Single Phase half-wave and full wave rectifiers with inductive and capacitive filters
9. Differential amplifiers using FET
10. Study of CRO for frequency and phase measurements
11. Realization of passive filters

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to understand and analyse electronic circuits.
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC 8
4. Function Generators
5. Regulated 3 output Power Supply 5, ± 15V
6. CRO
7. Storage Oscilloscope
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided

EE8311 ELECTRICAL MACHINES LABORATORY-I

OBJECTIVES:
• To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

LIST OF EXPERIMENTS
1. Open circuit and load characteristics of DC shunt generator- critical resistance and critical speed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt motor.
4. Load test on DC compound motor.
5. Load test on DC series motor.
6. Swinburne’s test and speed control of DC shunt motor.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner’s test on single phase transformers.
12 Study of starters and 3-phase transformers connections.

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to understand and analyze DC Generator
• Ability to understand and analyze DC Motor
• Ability to understand and analyse Transformers.
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement – 3 nos
2. DC Shunt Motor Coupled with Three phase Alternator – 1 No.
3. Single Phase Transformer – 4 nos
4. DC Series Motor with Loading Arrangement – 1 No.
5. DC compound Motor with Loading Arrangement – 1 No.
6. Three Phase Induction Motor with Loading Arrangement – 2 nos
7. Single Phase Induction Motor with Loading Arrangement – 1 No.
8. DC Shunt Motor Coupled With DC Compound Generator – 2 nos
9. DC Shunt Motor Coupled With DC Shunt Motor – 1 No.
10. Tachometer -Digital/Analog – 8 nos
11. Single Phase Auto Transformer – 2 nos
12. Three Phase Auto Transformer – 1 No.
13. Single Phase Resistive Loading Bank – 2 nos
14. Three Phase Resistive Loading Bank. – 2 nos