L	T	P	C
3	0	0	3

Course Code: EEE104
Semester: I

PRINCIPLES OF ELECTRICAL ENGINEERING

Course Objectives:

This course will help the learner to

1. Apply basic concepts of DC and AC circuits
2. Make use of the principles of electrostatics and electro mechanics.
3. Understand the basic methods for the measurement of electrical quantities.
4. Explore the concept of electrical Wiring and safety measures

UNIT – I **10 Periods**

Introduction and Basic Concepts: Concept of Potential difference, voltage, current - Fundamental linear passive and active elements to their functional current-voltage relation - Terminology and symbols in order to describe electric networks - Concept of work, power, energy and conversion of energy- Principle of batteries and application.
Principles of Electrostatics: Electrostatic field - electric field intensity - electric field strength - absolute permittivity - relative permittivity - capacitor composite – dielectric capacitors - capacitors in series & parallel - energy stored in capacitors - charging and discharging of capacitors.

UNIT – II **14 Periods**
DC Circuit Analysis: Voltage source and current sources, ideal and practical, Kirchhoff's laws and applications to network solutions using mesh analysis, - Simplifications of networks using series- parallel, Star/Delta transformation, DC circuits-Current-voltage relations of electric network by mathematical equations to analyse the network (Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem), Transient analysis of R-L, R-C and R-L-C Circuits.

AC Steady-state Analysis: AC waveform definitions - Form factor - Peak factor - study of R-L - R-C -RLC series circuit - R-L-C parallel circuit - phasor representation in polar and rectangular form - concept of impedance - admittance - active - reactive - apparent and complex power - power factor, Resonance in R-L-C circuits - 3 phase balanced AC Circuits

UNIT – III **10 Periods**

Principles of Electro Magnetics and Electro-mechanics: Electricity and Magnetism - magnetic field and faraday's law - self and mutual inductance - Ampere's law - Magnetic circuit - Magnetic material and B-H Curve – Single phase transformer - principle of operation - EMF equation - voltage ratio - current ratio – KVA rating - Electromechanical energy conversion – Elementary generator and motors.

UNIT – IV **11 Periods**

Measurements and Sensors: Introduction to measuring devices /sensors and transducers related to electrical signals - Elementary methods for the measurement of electrical quantities, impedance, power and energy in DC and AC systems and their practical application.

Electrical Wiring and Safety: Basic layout of distribution system - Types of Wiring System &Wiring Accessories –Electrical Safety - Necessity of earthing - Types of earthing.

TEXT BOOKS

1. A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, *Electric Machinery*, Tata McGraw Hill, Sixth Edition, 2005.
2. B. L.Theraja. *A Textbook of Electrical Technology*, vol. I, S. Chand and Company Ltd., New Delhi, 2012.
3. V. K. Mehta, *Basic Electrical Engineering*, S. Chand and Company Ltd, New Delhi, 2006.
4. I.J. Nagrath and Kothari, *Theory and problems of Basic Electrical Engineering*, Prentice Hall of India Pvt. Ltd., Second Edition, 2004.

REFERENCES

1. Edward Hughes, *Electrical Technology*, Pearson Education Publication, Tenth Edition, 2011.
2. Vincent. Del. Toro. *Electrical Engineering Fundamentals*, Prentice Hall India, Second Edition, 2015.
3. A Sudhakar, Shyammohan, *Circuits and Networks: Analysis and Synthesis*, Tata McGraw Hill Education, Fifth Edition, 2017.

UNIT-WISE LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to:

Unit I	• Understand the basic concepts and terminologies used in electric circuits • Recall the concept of electrostatic fields and explain the construction and applications of batteries
Unit II	• Analyze a circuit using Mesh Analysis, Thevenin's theorem, Maximum Power Transfer theorem and Superposition theorems • Analyze steady-state behavior of AC circuits with R, R-L, R-C, and R-L-C circuits and find power factor in three phase balanced AC circuits
Unit III	• Understand the generation of statically induced EMF in a transformer and explain the construction and operation of transformers • Describe the constructional aspects and applications of Electrical Machines
Unit IV	• Summarize elementary methods for the measurement of electrical quantities • Demonstrate simple domestic wiring and understand safety measures

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

- Analyze DC circuits using mesh analysis and apply network theorems
- Analyze AC circuits and find power and power factor in three phase AC circuits
- Relate the concepts of electrostatics and electromagnetics to understand the construction and applications of batteries, machines and transformers
- Summarize various methods for the measurement of electrical quantities and demonstrate domestic wiring concepts

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Course Code: EEE105
Semester: I

PRINCIPLES OF ELECTRICAL ENGINEERING LAB

Course Objectives:

This course will help the learner to verify basic laws of electric circuits and network theorem, simulate basic R-L-C series circuits and to study the time response of RC circuits, verify voltage current relationship in three phase system, and demonstrate electric wiring and electric power supply system.

LIST OF EXPERIMENTS

1. Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits
2. Verification of basic laws of electric circuits
3. Verification of voltage division and current division rules
4. Verification of Thevenin's and Norton's Theorem
5. Verification of Superposition and Maximum Power Transfer theorem
6. Simulation of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$
7. Simulation of Time response of RC circuit
8. Verification of relation in between voltage and current in three phase balanced star and delta connected loads.
9. Demonstration of measurement of electrical quantities in DC and AC systems.
10. Voltage-current relationship in a R-L & R-C series circuits and to determine the power factor of the circuit
11. Domestic wiring
12. Demonstration of electric power supply system
13. Demonstration of statically induced EMF

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to

- Analyze electric networks using basic laws and network theorems
- Interpret the simulation results of R-L-C series circuits
- Summarize the voltage-current relationship in three phase system
- Demonstrate domestic wiring and electric power supply system