

**SEMESTER-II**  
**COURSE 1: FUNDAMENTALS OF ELECTRICITY AND**  
**ELECTRONICS**

**Theory**

**3**

hrs/week

*Objectives*

*The students will learn:*

1. *basics of electrostatics, Gauss theorem and its applications, concept of a capacitor, various types of capacitors and dielectric constant, magnetic effects of current, cells and the measuring instruments like ammeter and voltmeter,*
2. *basics of p-n junction, rectifying action of a diode, regulated power supplies and wave shaping circuits, and*
3. *transistor and its three modes of operation, h-parameter model of a transistor and the frequency response of an amplifier.*

**UNIT-I Electrostatics:** Electric charges - Coulomb's law - Electric field - Electric intensity and electric potential - Relation between electric potential and intensity - Electric intensity and potential due to a uniform charged conducting sphere at a point outside, on, and inside the conductor. Electric dipole - Dipole moment - Intensity and potential due to a dipole - Statement and proof of Gauss law - Application of Gauss law to uniformly charged solid sphere.

**UNIT-II Capacitors:** Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in a charged capacitors - Force of attraction between plates of charged parallel plate capacitor - Kelvin's attracted disc electrometer - Measurement of potential and dielectric constant. Type of capacitors - Mica capacitor, Electrolytic capacitors, Variable air capacitor - Uses of capacitors.

**UNIT-III Electrical Measurements:** Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter. [ Magnetic Effect of Current: Biot-Savart's law [ Force on a conductor carrying current placed in a magnetic field - Principle, construction and theory of a moving coil ballistic galvanometer - Measurement of figure of merit of B.G. - Comparison of capacitors using B.G.

**UNIT-IV Diode circuits and power Supplies:** Junction diode characteristics - Half and full wave rectifiers - Expression for efficiency and ripple factor - Construction of low range power peak using diodes - Bridge rectifier - Filter circuits - Zener Diode - Characteristics - Regulated power supply using Zener diode - Clipper and Clamper using diodes. Differentiator and integrator using resistor and capacitor.

**UNIT-V Transistor circuits:** Characteristics of a transistor in CB, CE modes - Relative merits Graphical analysis in CE configuration - Transistor as a amplifier - RC coupled Single stage amplifier - Frequency response - Thevenin's and Norton's theorems - h parameters. Basis logic gates AND, OR, and NOT.

### **Text Books**

Electricity and Magnetism - M. Narayanamoorthi and Others, National Publishing Co., Chennai.

Electricity and Magnetism - R. Murugesan, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.

Principles of Electronics - V.K. Mehta, S. Chand & Co., 4/e, 2001. Basic Electronics - B.L. Theraja, S. Chand & Co., 4/e, 2001.

#### Reference Books

Electricity and Magnetism - Brijlal & Subrahmanyam, Ratan Prakashan Mandir, Agra.

Fundamentals of Electricity and Magnetism - B.D. Duggal & C.L. Chhabra, Shoban Lal Nagin Chand & Co., Jallundur. Physics, Vol. II -

Resnick, Halliday & Krane, 5/e, John Wiley & Sons, Inc., Basic Electronics - B. Grob, McGraw - hill, 6/e, NY, 1989.

Elements of Electronics - Bagde & Singh, S. Chand

## **Practical Course on Fundamentals of Electricity and Electronics**

**Work load: 30 hrs per semester**

**hrs/week**

**2**

**Minimum of six experiments to be done and recorded**

### **Practical Course**

**Objective:** This course provides students with a broad understanding of the physical principles of the Electricity and electronics, to help them develop critical thinking and quantitative reasoning skills, to empower them to think creatively and critically about scientific problems and experiments.

### **Experiments**

1. Mapping equipotential lines
2. Combination of capacitors ( Series and Parallel)
3. Comparison of resistance using Carey-foster's Bridge
4. Determination of specific resistance of a wire using Carey-Foster's Bridge
5. Internal resistance of dry cell using Potentiometer.
6. Zener diode – Characteristics
7. Clipper and Clamper circuits
8. Bridge rectifier- ripple factor and voltage regulation
9. Logic gates
10. Thevenin's theorem and Norton's theorem
11. Characteristics of a transistor in CE configuration
12. Frequency response of a R C coupled amplifier.