



**PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

Autonomous

Siddhartha Nagar, Vijayawada-520010

Re-accredited at 'A+' by the NAAC

23ELMAL121: Fundamentals of Electricity and Electronics

Offered to: B.Sc. Honours (Electronics)

Course Type: Major 3 (Core -TH)

Year of Introduction: 2023-24

Year of offering: 2023 - 2024

Semester: II

60 Hrs

Credits: 3

Course Outcomes: At the end of this course, students should be able to:

Course Outcome NO	Outcome	Mapping to
CO1	understand Basics of electrostatics, Gauss theorem and its applications	PO1
CO2	Understand the concept of a capacitor, various types of capacitors and dielectric constant.	PO7
CO3	Analyze magnetic effects of current, cells and the measuring instruments like ammeter and voltmeter	PO3
CO4	illustrate Sinusoidal Alternating Waveforms	PO6
CO5	Analyze RC, RL and RLC Circuits	PO2

CO-PO MATRIX								
	CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
23ELMAL121	CO1	2						
	CO2							2
	CO3			3				
	CO4						2	
	CO5		2					

UNIT-I

12L

Electrostatics:

A. 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.

B. Electric dipole, Dipole moment, Intensity and potential due to a dipole, Statement, and proof of Gauss law - Application of Gauss law to the uniformly charged solid sphere.

UNIT-II

12L

Capacitors: **A.** Definition and unit of capacity - Capacitance of a parallel plate capacitor - Effect of dielectric on capacity - Capacitors in series and parallel - Energy stored in charged capacitors .

B. The 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

12L

Electrical Measurements: **A.** Carey-Foster bridge - Determination of specific resistance - Potentiometer - Calibration of low and high range voltmeters - Calibration of Low range ammeter.

B. Magnetic Induction, 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 the figure of merit of B.G. Comparison of capacitors using B.G

UNIT-IV

12L

Sinusoidal Alternating Waveforms: Definition of Current and Voltage. The Sine Wave, General Format of Sine Wave for Voltage or Current, Phase Relations, Average Value, Effective (R.M.S) Values, Differences between A.C and D.C, Phase relation of R,L and C.

UNIT-V

12L

RC, RL and RLC Circuits: Frequency Response of RC and RL Circuits, Their Action as Low Pass and High Pass Filters, Passive Differentiating and Integrating Circuits, Series Resonance and Parallel Resonance Circuits, Q -Factor.

Text Books:

1. Electricity and Magnetism - M. Narayana Moorthi and Others, National Publishing Co., Chennai.
2. Electricity and Magnetism - R. Murugesan, S. Chand & Co. Ltd., New Delhi, Revised Edition, 2006.
3. Introductory circuit Analysis (UBS Publications) ---Robert L. Boylestad.

Reference Books

1. Electricity and Magnetism - Brijlal & Subrahmanyam, Ratan Prakashan Mandir, Agra.
2. Principles of Electronics - V.K. Mehta, S. Chand & Co., 4/e, 2001.
3. Basic Electronics - B. Grob, McGraw - hill, 6/e, NY, 1989.



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23ELMAL121: Fundamentals of Electricity and Electronics

Major: 3

B.Sc. Honours (Electronics)

Semester II

Time: 3 hours

Maximum Marks: 70

SECTION-A

Answer the following questions:

5x4=20M

1. (a) state and explain about Coulomb's law. (CO1-L1)
(OR)
(b) Explain the electric dipole and electric dipole moment. (CO1-L1)
2. (a) Briefly explain Capacitance of a parallel plate capacitor. (CO2-L1)
(OR)
(b) Describe any two types of capacitors and their uses. (CO2-L1)
3. (a) Explain about Potentiometer. (CO3-L2)
(OR)
(b) State and explain Biot-Savart's law. (CO3-L2)
4. (a) Define the following terms. (CO4- L1) (1+1+1+2)M
i. Amplitude ii. Time period iii. Cycle iv. Peak Factor.
(OR)
(b) Deduce the effective values of sinusoidal current. (CO4- L1) 5M
5. (a) Write short notes on basic response of R, L & C elements. (CO5-L1) 5M
(OR)
(b) Derive the expression for voltages and current in series resonance circuits. (CO5-L1)

SECTION-B

Answer the following:

5 x 10 = 50 M

6. a) Discuss the electric potential due to a uniformly charged spherical shell. (CO1-L2)
(OR)
b) State and prove the Gauss theorem in electrostatics. Derive an expression for the electric field due to a uniformly charged sphere. (CO1-L2)

7. a) Define the capacity of a condenser. Derive an expression for the energy stored in a Charged capacitor. (Co2- L2)

(OR)

b) Describe the construction and working of the attracted disc electrometer. How are potential differences measured with it? (Co2- L2)

8. a) Give the theory of Cary Foster's bridge. How the specific resistance of the material of a wire may be accurately determined. (Co3-L2)

(OR)

b) Discuss the construction and working of a ballistic galvanometer. (Co3- L2)

9. (a) Derive RMS value of sinusoidal waveform. (Co4-L3) 5M
Explain frequency response of resistor and reactor. (Co4-L3) 5M

(OR)

(b) What is alternating current? How does it differ from direct current? Derive an expression for average value of A.C. Define form factor .Give its significance (co4-L3) (2+3+4+1) M

10. (a) Explain how RC circuits acts like low pass filter and high pass filter.(Co5- L2) 10M

(OR)

(b) Discuss LCR series resonance circuit and derive it's parameters.(Co5- L2)
