Syllabus for B.Sc. III Semester
Optional Physics
PHY 301: Paper 3: Electricity, Vector analysis & Electromagnetic theory

Total hours of teaching time:50

1. **Basic Electrical Components** **4 hrs**

Definitions of resistance, capacitance and inductance; colour code and ratings and their defining equations. Ideas of reactance and impedance.

2. **Network Theorems** **6 hrs**

Revision of Kirchhoff's current and voltage laws, Voltage and current divider circuits. Thevenin's, Norton's Reciprocity and Maximum power theorems with examples.

3. **Alternating Currents** **12 hrs**

Expression for mean and rms values. Response of LR, CR and LCR circuits to sinusoidal voltages using j-operator. Series & parallel resonant circuits, band width, Q-factor. Power in electrical circuits, Maxwell and Anderson bridges, Derive expression for L and discuss experimental determination of L by Anderson bridge. RC Filter circuits: High pass & low pass.

4. **Cathode Ray Oscilloscope** **5 hrs**

Construction and working of cathode ray oscilloscope, Expression for electrostatic and magnetic deflection sensitivity, Measurement of voltage, current, frequency and phase of the signals using CRO.

5. **Galvanometers** **5 hrs**

Construction, working and theory of Helmholtz galvanometer, moving coil galvanometer, Dead beat galvanometer and Ballistic galvanometer. Construction and study of simple Analog-multimeter.

6. **Vector Analysis:** **6 hrs**

Review of vector algebra, vector calculus, Scalars and vectors. Gradient, divergence and curl and their physical significance. Vector identities. Statements of Gauss, Stokes' and green's theorems.

7. **Electromagnetic Theory** **12 hrs**

Coulomb's law, electrostatic field, Gauss law, applications of Gauss law, electrostatic potential, poison's & Laplace's equations. Biot- Savart law, Ampere's circuit law and its applications. Concept of dipole, current loop as a dipole. Torque on a dipole. Concept of displacement current. Maxwell's electromagnetic field equations (no derivations). Modified Ampere's circuit law. Wave equation for field vectors. Statement of Pointing theorem and its physical significance. Equation for plane electromagnetic waves in free space. Production of electromagnetic waves. Hertz experiment.

Reference books

1. Electricity and magnetism by K. K Tewari
2. Electricity and magnetism by Sehigal and Chopra
3. Electricity and magnetism by Khare and Srivastav
4. Physics part-II by Halliday and Resnik
5. Electrodynamics by B.B.Laud
6. Fundamentals of Electronics by B.Basavaraj

PHYL3: Practical course for Semester III

Instructions

1. Two experiments (3 hours duration each) per week should be performed.
2. One practical internal test of 3 hours duration for 15 marks be conducted at the end of practical course in the semester.
3. Minimum of 12 experiments from the list mentioned below should be performed in semester III. Of these, one experiment can be open ended type (Course teacher may develop a new innovative experiment and introduce into the course). Open ended experiment must also be considered for examination.

List of experiments

1. Verification of current divider theorem and voltage divider theorem.
2. Verification of Thevenin 's theorem and reciprocity theorem.
3. Verification of Norton's theorem and maximum power transfer theorem.
4. Determination of time constant of an RC circuit (both charging and discharging).

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5. Frequency of AC using Sonometer.
6. Determination of cut off frequency –RC low pass and high pass filters.
7. LCR series and parallel resonance –determination of resonant frequency, bandwidth and Q-factor.
8. Determination of time period, frequency, amplitude and phase of an ac signal using CRO.
9. Comparison of frequencies by Lissajous figures using CRO.
10. Determination of capacitance using de sauty's dc bridge using spot galvanometer.
11. De sauty's ac bridge – determination of capacitance of the given capacitor.
12. Study of variation of thermo emf with temperature.
13. Determination of B_H using Helmholtz galvanometer.
14. Measurement of low resistance.
15. Charge sensitivity of B.G.
16. Dispersive power of prism/grating.
17. Double refraction –determination of and
18. Dispersive power of plane diffraction grating.
19. Diffraction grating –minimum deviation method.
20. Resolving power of prism.
21. Verification of Newton's formula for the equivalent focal length of two convex lenses separated by a distance (with principle plane, focal plane, nodal planes).