JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER

Programme: B.Sc. **Semester: VI**

PHYSICS PAPER VIII
ELECTRONICS, MAGNETIC MATERIALS, DIELECTRICS AND QUNTUM MECHANICS – II

Course Code: 18VIPH8 **No. of Hours: 45**

COURSE OBJECTIVES:

- To acquire the knowledge about the electronic component like operational amplifier; Open loop configuration, feedback concepct– Limitations and applications.
- To learn Properties of dielectrics, Local field and Claussius –Mossitti relation ad applications and Properties of magnetic materials, Domain theory, Heisenberg theory of exchange, applications
- To learn the concept of wave function, Schrodinger equation and their applications and to study role of uncertainty in quantum physics.

LEARNING OUTCOMES:

- Students shall learn the significance of operational amplifiers and how they operate.
- They will be able to list and analyze the properties of dielectric materials.
- Students develop the idea of wave function, understand the uncertainty relations and will be able to Solve Schrodinger equation for simple potentials

UNIT I

OPAMPS

Operational amplifiers

Block Diagram of an OPAMP, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open loop configuration - Limitations, Gain Bandwidth Product, Frequency Response, CMRR, Slew Rate and concept of Virtual Ground **02 HRS**

Feedback concepts, Advantages of feedback, types of feedback, Expression for Gain; OPAMP as a feedback amplifier – Non – Inverting and Inverting amplifier, Modification of input and output impedances with feedback ; Voltage follower; Differential amplifier with feedback; **02 HRS**

Linear Applications - frequency response of Low pass, high pass and band pass filters (first order), inverting summing amplifier, ideal Differentiator, Integrator; **02 HRS**

OPAMP Oscillators

Positive Feedback concept - oscillator operation –Barkhausen Criterion; Types of oscillator circuits (Qualitative); Phase shift oscillator and Wien bridge oscillator (using op amp). **03 HRS**

DIGITAL ELECTRONICS

Number Systems: binary, octal, hexadecimal (interconversions) **01 HRS**

Logic gates and truth tables : OR gate, AND gate; Inverter (the NOT function); NAND and NOR; exclusive OR; exclusive NOR. **01 HRS**

Boolean laws and theorems – simplification of SOP equations; Realization of AND, OR, NOT using universal gates NAND and NOR; **02 HRS**

Combination logic: Adders (full and half adder) and Subtractors (half) **02 HRS**

UNIT II

MAGNETIC PROPERTIES OF MATTER AND DIELECTRICS

Magnetic Properties of Matter **02 HRS**

Review of basic formulae : Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, magnetization (M), Classification of Dia – , Para –, and ferro – magnetic materials; Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Curie- Weiss law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss, Hard and Soft magnetic materials **07 HRS**

Dielectrics : Static dielectric constant, polarizability (electronic, ionic and orientation), calculation of Lorentz field (derivation), Clausius-Mosotti equation (derivation), dielectric breakdown, electrostriction (qualitative), electrets. **06 HRS**

UNIT-III

QUANTUM MECHANICS-II

The concept of wave function, physical significance of wave function. Development of time dependent and time independent Schrodinger's wave equation. Max Born's interpretation of the wave function. Normalization and expectation values, Quantum mechanical operators, Eigen values and Eigen functions. Applications of Schrodinger's equation – free particle, particle in one dimensional box- derivation of Eigen values and Eigen function – extension to three dimensional box; Development of Schrodinger's equation for One dimensional Linear harmonic oscillator (derive). **15 HRS**

REFERENCES

1. OPAMPS and Linear Integrated Circuits, **Ramakant A Gayakwad**, PHI Learning Private Limited, 4th Edition
2. Operational Amplifiers with Linear Integrated Circuits, **William D Stanley**, Pearson, 4th Edition
3. Electronic Devices and Circuit Theory**, Robert Boylestead and Louis Nashelsky**, PHI Learning Private Limited, 10th Edition
4. Digital Principles and applications, **Leach and Malvino**, MC – Graw Hill, 5th Edition
5. Introduction to solid State Physics, ***Charles Kittel***, VII edition, (**1996**.)
6. Solid State Physics- **A J Dekker**, MacMillan India Ltd, (**2000**)
7. Elementary Solid State Physic, **J P Srivastava**,PHI,(**2008**)
8. Essential of crystallography**, M A Wahab**, Narosa Publications (**2009**)
9. Solid State Physics-**F W Ashcroft and A D Mermin**-Saunders College (**1976**)
10. Solid State Physics-**S O Pillai**-New Age Int. Publishers (**2001**)
11. Quantum Mechanics, ***B.H. Bransden and C.J. Joachain***, 2nd Edition, Pearson Education (**2004**)
12. Introduction to Quantum Mechanics, ***David J. Griffiths***, 2nd Edition, Pearson Education, (**2005**)
13. Modern Quantum Mechanics, ***J.J. Sakurai***, Pearson Education, (**2000**)
14. Principles of Quantum Mechanics, ***Ghatak and Lokanathan***, Macmillan, (**2004**)

PHYSICS PRACTICAL
PAPER – 8

1. Low pass filter using Op-amp
2. High pass filter using Op-amp
3. Band pass filter using Op-amp
4. Op-amp inverting and non – inverting amplifier – ac or dc
5. OPamp as a differential amplifier – COMMON MODE AND DIFFERENTIAL MODE
6. Op-amp-summing amplifier – ac and dc,
7. OPamp as integrator and differentiator.
8. Phase shift oscillator using op –amp
9. Wien-bridge Oscillator using op – amp
10. To design an Astable Multivibrator of given specifications using 555 Timer
11. Determination of dielectric constant.
12. Determination of dipole moment of organic liquid
13. To verify and design AND, OR, NOT and XOR gates using NAND gates
14. Digital Half-adder & Full-adder circuits using logic gate ICs.
15. B-H curve using oscilloscope.

Note : A minimum of EIGHT experiments must be performed.

REFERENCES:

1. IGNOU : Practical Physics Manual
2. Saraf : Experiment in Physics, Vikas Publications
3. S.P. Singh : Advanced Practical Physics
4. Melissons : Experiments in Modern Physics
5. Misra and Misra, Physics Lab. Manual, South Asian publishers, (**2000**)
6. Gupta and Kumar, Practical physics, Pragati prakashan, (**1976**)

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