

Bajaj College of Science, Wardha (Autonomous)

Syllabus for B. Sc. III (SEM-VI) w.e.f. 2019-20

Physics VI (BCSPHYT306)

Unit I: Quantum II [10h]

Schrodinger's Equation: Time dependent and time independent equations, wave function Ψ and its physical significance, Operators, Expectation values of dynamical quantities, Ehrenfest theorem, Eigen values and Eigen functions, Free particle, Free Particle in a one-dimensional box and three-dimensional box.

Unit II: Nuclear II [10h]

Radioactivity: stability of nucleus, Law of radioactive decay, mean life & half-life; α -decay, Range of alpha particles, Geiger Nuttal law, Magnetic spectrometer for the energy of α particles, Tunneling, Gamow's theory of α -decay, β -decay, measurement of energy of β -decay and end point energy, Neutrino theory of β -decay, Gamma decay, energy of gamma photon.

Unit III: Physics of Solid State [10h]

Drude Lorentz model, Mean free path, Electrical and thermal conductivity, Weidmann Franz law (derivation), thermoelectric effect, Density of states, Fermi energy, Fermi temperature. Band theory of solids- Bloch theorem (statement only), Kroning Penny model, concept of hole, Hall effect, Energy bands in solid, distinction between metal, semiconductor, and insulator.

Unit IV: Operational Amplifier and Oscillators [10h]

Operational Amplifier: Direct coupled amplifier, Difference amplifier, parameters of Op-Amp, Basic idea of IC-741, Application of Op-Amp as Inverting amplifier, non-Inverting amplifier, Adder, subtractor, Integrator, Differentiator.

Oscillators: Concept of feedback, Physical considerations of tuned circuits, Phase shift oscillators, Hartley Oscillator, Colpitt's oscillator.

Unit V: Digital Electronics [10h]

Number Systems- Unitary systems, Binary, decimal, octal, hexadecimal and their inter-conversions, Binary coded decimal (BCD), Addition and subtraction of binary numbers, 1S, 2S and 10S compliment, basic logic gates, NOR, NAND, Ex-OR Ex-NOR gates and their truth table, Half adder, Full adder, Half subtractor and full subtractor, Boolean equations, De Morgan's theorem and its verification.

Unit VI: Communication and Fiber Optics [10h]

Communication: Modulations and its needs, Amplitude modulation. Frequency spectrum, modulation factor, over modulation, percentage modulation, Expression for power and currents in AM wave. Disadvantages. Frequency modulation. Frequency deviation, carrier swing, modulation index, Deviation ratio, Expression for FM wave, frequency spectrum, significant side band terms, F M bandwidth, merits and demerits.

Fiber Optics- Importance of optical fiber, Propagation of light waves in optical fiber, Basic structure, step index mono mode fiber, Graded index fiber, Acceptance angle and acceptance cone, Numerical aperture, Fiber losses and their units (basic concept), Electrical and optical band width, band width length product, Dispersion in optical fiber, applications.

Laboratory-6 (BSCPHYP306)

List of Experiments (Any 12) [40h]

1. To determine the energy gap of semiconductor using PN junction diode in reverse bias mode.
2. To determine the Hall coefficient of charge carriers in semiconductor.
3. Study of thermo emf.
4. To study the Op-Amp as an inverting and non-inverting amplifier.
5. To study the Op-Amp as adder/subtractor.
6. To study the Op-Amp as integrator/differentiator.
7. To study the phase shift/Wein's bridge oscillator.
8. To study the Hartley/Colpitts oscillator.
9. To study the Amplitude modulation
10. To study Diode as detector.
11. To study the Frequency modulation.
12. To organize basic operations (AND, OR, NOT) using universal gates (NAND, NOR).
13. To verify the De Morgan's theorem.
14. To study the characteristics of NOR/NAND gate and verification of truth table.
15. To verify the laws of Boolean algebra.
16. To study the Ex-OR gate as half adder and full adder.
17. To study the Ex-OR gate as half subtractor and full subtractor.
18. Determination of step index of optical fiber.
19. To study total internal reflection and determination of critical angle.

Reference Books for Theory:

1. Introduction to Quantum Mechanics, David J. Griffith, 2nd Ed. 2005, Pearson Education.
2. Quantum Mechanics, G. Aruldas, 2nd Edn. 2002, PHI Learning of India.
3. Introductory Nuclear Physics by Kenneth Krene (John Wiley and sons)
4. Nuclear Physics by S.N. Ghoshal (S. Chand).
5. Perspectives of modern physics - By A. Beiser.
6. Concepts of Modern Physics: Arthur Beiser (Tata Mc Graw Hill)
7. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley IndiaPvt. Ltd
8. Solid State Physics and Electronics, by R. K. Puri, and V. K. Babbar.
9. Elements of Solid-State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hallof India
10. Op-Amp and Linear Integrated Circuits, 2nd edition by Ramakant Gaikwad (PHI)
11. Digital and Analog Technique by Navneet, Gokhale, Kale (Kitab Mahal)
12. Basic Electronics by B.C. Theraja(S. Chand)
13. An Introduction to Fiber Optics by Allen Shotwell
14. Optical Fiber Communication by John M. Senior.
15. Digital Principle and Application by Malvino and Leach.
16. Digital Electronics by V.K. Jain.
17. Communication Electronics by A. Kumar

Reference Books for Practicals:

1. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.

2. A Textbook of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Engineering Practical Physics, S.Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
5. Physics through experiments, B Saraf et. al., Vikas Publications 1987.
6. Advanced practical physics, Chauhan & Singh, Pragathi Publications 1ed.
7. Practical Physics, D. Chattopadhyaya et al., Central Publications.
8. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, BSaha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002
9. Practical Physics, D C Tayal, 2002.