Dr. Babasaheb Ambedkar Marathawada University
Aurangabad

Syllabus

of

B.Sc. III Year

PHYSICS

Semester-V & VI

Effective from academic Year June 2011-12

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.

B.Sc. Physics (Optional) course structure in Semester system.

(Semester V th and VI th)

B.Sc. Third Year

Semester	Course Code	Paper Number	Title of Paper	Marks
V	PHY – 501	XVII	Classical and Quantum Mechanics	50
	PHY – 502	XVIII	Solid State Physics and Semiconductor Devices	50
	PHY – 503	XIX	Practical Paper	50
	PHY – 504	XX	Practical Paper	50
VI	PHY – 601	XXI	Atomic and Molecular Spectra, Nuclear Physics	50
	PHY – 602	XXII	Solid State and Nano Physics, Electronics	50
	PHY – 603	XXIII	Practical Paper	50
	PHY – 604	XXIV	Practical Paper	50

B.Sc. Third Year (Vth Semester)

Course – PHY- 501- Paper XVII Marks: - 50

Classical and Quantum Mechanics----- (45 periods)

1. **Basic concept of Classical Mechanics:** Mechanics of particle, Mechanics of System of Particles, constraints, Holonomic and Non Holonomic constraints, Virtual work, Alembert's Principle, Lagrange's equations, Simple Application of Lagrange's formulation- Linear Harmonic Oscillator, simple Pendulum.
2. **Quantum Theory:** Origin of Quantum theory, Black body Radiations, Distribution of energy in the Spectrum of black body Radiation, Photoelectric effect, Laws of photoelectric emission, Ritz combination principle, Planck's radiation.
3. **De Broglie's Wave and Uncertainty Principle:** Inadequacy of classical mechanics, two slit experiment, superposition Principle, Wave particle dualism for light and matter, De Broglie's Wave, De Broglie's model of the atom, wave Velocity and group velocity, Heisenberg uncertainty Principle.

   Application of uncertainty Principle – (1) Energy and radius of Bohr First Orbit (2) Why electron cannot present in the nucleus.
4. **Schrodinger Equation and its Application:** Concept of Wave function " **Ψ**", Schrodinger Equations- Time dependent form, Expectation Value, Operators, Time Independent Schrodinger equation (Steady State form), Particle in one dimensional box, energy Quantization, Wave function.

Reference Books

1. Classical Mechanics – Herbert Goldstein

2. Classical Mechanics – J.C. Upadhayaya

3. Classical Mechanics – Gupta – Kumar (Pragati publication)

4. Perspective of Modern Physics – Bezier

5. Quantum Mechanics – Robert Eisberg

6. Modern Physics – J. B. Rajam

7. Quantum Mechanics – B. S. Rajput

8. Elements of Quantum Mechanics – Kamal Singh-S.P. Singh.

9. Atomic and nuclear Physics – N. Subramayam- Brijlal (S. Chand Publication)

B.Sc. Third Year (Vth Semester)

Course – PHY- 502 - Paper XVIII Marks: - 50

Solid State Physics and Semiconductor Devices

(45 periods)

1. **Crystal Structure:** Introduction, Crystal lattice and translation vectors, unit cell, Basis, Symmetry operations , point groups and space groups, types of lattices (Plane lattice and Space lattice with bcc and fcc), Lattice directions and planes, Miller indices, simple Crystal structure.
2. **Bonding and Band Theory of Solids:** Introduction, Concept of inter-atomic forces, Cohesive energy and types of bonding, Primary bonds (ionic bonds, Covalent bond and metallic bond), secondary bonds(Vander walls bond and hydrogen bonds)

   The Bloch theorem (only statement and properties), The Kroning Perry model, Energy versus Wave Vector relationship --- different representations (Brillouin Zones).
3. **Semiconductor devices:** - Introduction, construction, working and characteristics of semiconductor diode, Zener diode, transistor (n-p-n and p-n-p transistor), Transistor characteristics (CB, CE, CC), JFET (Construction and its characteristics).
4. **D.C.Circuits:** Introduction, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem

Reference Books

1. Solid State Physics --- S.O Pillai.

2. Crystography Applied to solid sate Physics --- A.R. Verma, O.N. Srivastava

3. Solid State Physics ----- Gupta Kumar

4. Fundamental of solid State Physics ---- Sexena, Gupta, Sexena

5. Solid state Physics ----- Deccar

6. Solid State Physics ----- R.K. puri, V.K. Babbar

7. Principle Electronics ---- V.K. Mehta

8. A text Book of Electrical technology ----- B.L. Thereja and A K Thereja

B.Sc. Third Year (Vth Semester)

Course – PHY- 503 - Paper XIX Marks: - 50

List of Experiments ----------

1. Y by Koenig's method
2. Surface tension by ripple's method
3. Edser "A" Pattern
4. Determination of wavelength of sodium light using Biprism.
5. Measurment of velocity of sound in free air(Expt: 55, Advanced level Practical Physics by M. Nellkon and J.M. Ogbran,4th edition, publication)
6. Energy band gap of semiconductor using thermister.
7. Determination of Rydberg constant using Microsoft excels.
8. Determination of I-H curve using Microsoft excels.

Course – PHY- 504 - Paper XX Marks: - 50

List of Experiments ----------

1. . 'e' by Millikan's oil drop method
2. Voltage regulation using Zener diode (Line and load regulation).
3. Study of transistor characteristics in CE configuration.
4. Study of transistor characteristics in CB configuration
5. Study of Emitter follower.
6. To study bridge rectifier without using any filter (trace wave form using CRO)
7. Determination of e/m using Microsoft excels.
8. Study transistor characteristics in CE and CB configuration and determination of α and β using Microsoft excels

☼ **Note: At least six experiments should be performed for each paper.**

B.Sc. Third Year (VI th Semester)

Course – PHY- 601 - Paper XXI **Marks: - 50**

Atomic and Molecular Spectra, Nuclear Physics (45 periods)

1. **Atomic Physics:** spectra of hydrogen, deuteron, alkali atoms, spectral terms, doublet fine structure, screening constants of alkali spectra for s, p ,d and f states, selection rules singlet, triplet fine structure in alkaline earth spectra, L-S and J-J coupling
2. **Molecular physics:** Molecular spectra, experimental study, Rotational spectra, Intensities of rotational lines, vibrational spectra, Rotational and vibrational bands and their theoretical explanations

   Raman effect, results of Raman effect, Practical important of Raman effect.
3. **Nuclear forces and Models:** Introduction of nuclear forces, nuclear binding energy, theoretical and practical estimate of dependence of binding energy, saturation, short range type, Nuclear fission and fusion, magic number, shell models, Liquid drop model.
4. **Particle Accelerators:** Particle accelerator, linear resonance accelerator, cyclotron, synchro cyclotron, Vande-graff generator,

Reference Books

1. Introduction of Atomic spectra- White.

2. Atomic Physics – Herzberg.

3. Atomic and Nuclear Physics – N.Subramanayam and Brijlal

4. Nuclear Physics – Rajkumar

5. Elements of nuclear physics – M.L Pandya, R.P. Yadhave

6. An Introduction to Nuclear Physics – M.R. Bhiday, Mrs V. A. Joshi

7. Nuclear Physics – B.N Shrivastav

8. Nuclear Physics – Kaplan

B.Sc. Third Year (VI th Semester)

Course – PHY- 602- Paper XXII Marks:-50

Solid State and Nano Physics, Electronics ----- (45 periods)

1. Thermal Properties of Solids: Classical theory of lattice heat capacity(Concept and Comparison with experimental values), Concept of Einstein's theory of lattice heat capacity, density of modes of vibrations(in 1-D, 2-D and 3-D)**,** Debye's model of lattice heat capacity(derivation), limitation of Debye's model**.**

2. Nano Physics: Introduction, one dimensional nanoscale, two dimensional nanoscale, three dimensional nanoscale, Application of nanomaterial: - Composites, Coating and surfaces, Magnetic Materials.

3. Transistor –- Biasing : Introduction, Faithful amplification, Transistor biasing, stabilization, Essential of a transistor biasing circuit, stability factor, Method of transistor biasing, Base Resistor method, biasing with feedback resistor, Voltage divider biasing method.

4. Operational Amplifier (OP –Amp) : Definition of OP- Amp, Characteristics of Op- Amp , parameters- CMRR, Gain of inverting and non-inverting OP-Amp, Buffer, Adder, Subtractor, Integrator and Differentiator.

Reference Books

1. Solid State Physics --- S.O Pillai.

2. Crystography Applied to solid sate Physics --- A.R. Verma, O.N. Srivastava

3. Solid State Physics ----- Gupta Kumar

4. Fundamental of solid State Physics ---- Sexena, Gupta, Sexena

5. Solid state Physics ----- Deccar

6. Solid State Physics ----- R.K. puri, V.K. Babbar

7. Electronics Principles and Applicaton (Vth Edition) – John D Ryder

8. Electronics – K. J. M. Rao.

9. Principle of electronics ----- A.P. Malvino.

10. College Physics --- R.T. Sarode (Himalaya Publication)

11. Nanotechnology : Nanostructure and Nanomaterials ----- M. Balkrishanarao and K. Krishana Reddy

B.Sc. Third Year (VIth Semester)

Course – PHY- 603 - Paper XXIII **Marks : - 50**

List of Experiments ---------

1. Hartsmann's Dispersion formula
2. Maxwell's Bridge (Measurement of inductance using impendence at different frequencies).
3. Determination of wavelength using diffraction grating (Normal incidence).
4. Constant of B.G by standard condenser Method.
5. Calibration of Bridge wire using Carry foster Bridge.
6. "h" by Photocell.
7. OP – Amp as Adder and Subtractor..
8. Study of absorption spectra of Iodine and determination of its wavelength using grating.

Course – PHY- 604 - Paper XXIV **Marks: - 50**

List of Experiments ----------

1. Study of CE amplifier.
2. Study of wien bridge oscillator using transistor / OPAMP.
3. Study of Hartley Oscillator using transistor.
4. To study the characteristics of JFET (Determination of μ, gm rd).
5. To verify the Thevenin's theoram.
6. To verify the superposition theoram
7. To plot the graph between current and frequency in series LCR circuit and to find the resonant frequency quality factor and band width (Practical Physics- by C.L. Arora)
8. To study JFET characteristics by using Microsoft Excel.

☼ **Note: At least six experiments should be performed for each paper.**

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B.Sc. Physics (Optional) course structure in Semester system.

B.Sc. Third Year (Semester V th and VI th)

Question Paper Pattern

Time : 1.5 Hours **Marks : 30.**

Q. 1. Attempt Any One **10**

(a) Chapter 1
(b) Chapter 3

Q. 2. Attempt Any One **10**

(a) Chapter 2
(b) Chapter 4

Q. 3. Attempt Any One **10**

(a) I. Chapter 1
II. Chapter 3

(b) I. Chapter 2
II. Chapter 4

Note : In Question No. 3, five marks should be devoted to problem.