Rajarshi Shahu Mahavidyalaya, Latur

(Autonomous)

BoS in Physics

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

(w.e.f. Academic Year 2020-21)

SYLLABUS FOR B.Sc.-I EXAMINATION

B.Sc.-I, PHYSICS

JUNE - 2020

Rajarshi Shahu Mahavidyalaya Latur
(Autonomous)
Department of Physics and Electronics (w.e.f. 2020-21) Structure of B.Sc. I Physics Syllabi under Choice Based Credit System

Sr No	Course Code	Title	Credits	Periods /Week	Marks		
		Semester I			In Sem	End Sem	Total
1	U-PHY-135	Mechanics and Properties of Matter-I	2	3	20	30	50
2	U-PHY-136	Heat and thermodynamics-II	2	3	20	30	50
3	U-PHY-137	Physics Laboratory Course I	1	3		50	50
		Semester II					
4	U-PHY-236	Electricity and Magnetism-III	2	3	20	30	50
5	U-PHY-237	Basic Electronics-IV	2	3	20	30	50
6	U-PHY-238	Physics Laboratory Course II	1	3		50	50
		Total	10				300

B.Sc. I Physics Semester I

Course Code- U-PHY-135

Mechanics and Properties of Matter-I

No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -45

Learning Objectives:

(1) Make students familiar about the relation between gravitation, mass, gravitational energy and potential energy,

(2) Enrich students with the knowledge of properties of fluids,

(3) Develop understanding of elastic nature of materials,

(4) Build up an understanding of fundamental physical principles,

(5) Build up basic skills necessary for solving problems with practical applications by using physical principles,

(6) Equip students with the skills required for understanding of physical principles in terms of multiple representations: graphs, diagrams, equations, (7) Familiarize students with the basic data analysis skills.

Course outcomes:

After successful learning, the students shall demonstrate ability to:

(1) Understand that all objects, irrespective of their mass, experience the same acceleration 'g' when falling freely under the influence of gravity at the same point on the Earth,

(2) Understand that if gravity is the only force acting on an object, the sum of kinetic energy and gravitational energy is constant,

(3) Explain various forms of potential energy,

(4) Use kinematic equations to describe non-accelerated and accelerated motions of an object,

(5) Apply Newton's laws of motion to solve linear dynamic problems,

(6) Use the work-energy approach to solve dynamic problems involving conservative and non-conservative forces,

(7) Apply rotational analogs of Newton's laws of motion to solve dynamics problems involving rotational motion.

Unit I: Gravitation (Book-1) (Periods 11)

Introduction, Kepler's laws, Newton's law of gravitation, Newton's deductions from Kepler's laws, gravitational potential due to a spherical shell: i) at a point outside the shell, ii) at a point inside the shell, gravitational potential due to a solid sphere, numerical problems

Unit II: Elasticity (Book-1) (Periods 12)

Introduction, twisting couple on a cylinder, torsional pendulum, determination of coefficient of modulus of rigidity of a wire: statistical method, dynamical method Maxwells needle, bending of beams, bending moment, cantilever loaded at free end: when the weight of the beam is ineffective and effective, beam loaded at the centre, numerical problems

Unit III: Surface Tension (Book-1) (Periods 11)

Introduction, pressure difference across a liquid surface (case of drops and bubbles), rise of liquid in a capillary tube, experimental determination of surface tension by Jaeger's method and Ferguson method, factors affecting surface tension, numerical problems

Unit IV: Viscosity (Book-1) (Periods 11)

Introduction, rate of flow of fluid, lines and tubes of flow, Reynolds number, co-efficient of viscosity, Poiseuille's equation for flow of liquid through a horizontal capillary tube, η by Poiseuille's method, Stoke's law, rotation viscometer, variation of viscosity of a liquid with temperature and pressure, numerical problems.

Recommended Book:

1. Elements of Properties of Matter--- D.S Mathur, Shyamlal charitable trust, New Delhi.

Reference Books:

2. General Properties of Matter---J. C. Upadhyaya, Ram Prasad and Sons publishers.
3. Properties of Matter --- Brijlal and Subramanyam, S. Chand and Co.

B.Sc. I Physics Semester I

Course Code- U-PHY-136
Heat and Thermodynamics-II
No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -45

Learning Objectives:

(1) Develop understanding of nature of heat transfer, transport Phenomena in gases, behavior of gases at different temperatures,
(2) Create awareness among students about laws of Thermodynamics,
(3) Familiarize students about entropy, heat engines, refrigerators, etc;
(4) Adapting the gained knowledge about thermodynamic system using thermodynamic potentials.

Course Outcomes:

Upon successful completion, students will be able to:

(1) State the nature of heat transfer, transport phenomena in gases, behavior of various gases at different temperatures.
(2) Know the zeroth law, First Law, Second law and Third law.
(3) Define heat, work, efficiency and the difference between various forms of energy.
(4) Explain entropy changes of the thermodynamic system.
(5) Describe energy exchange processes.

UNIT I: Transport Phenomena in Gases (Book-1) (Periods 11)

Introduction, mean free path, sphere of influence, expression for mean free path, three transport phenomena in gases, Viscosity, Thermal conductivity and self diffusion of gases, effect of temperature and pressure on mean free path, relation between three transport coefficients, numerical problems

UNIT II: Behavior of Real Gases (Book-1) (Periods 11)

Introduction, change of state, continuity of state, Andrew's experiment on CO2, behavior of gases at high pressure, Boyle's temperature, Vander Wall's equation of state, estimation of critical constants, reduced equation of state, Joule-Thomson Porous Plug experiment, relation between the Boyle temperature, Inversion temperature & critical temperature, numerical problems

UNIT III: Thermodynamics (Book-1) (Periods 12)

Introduction, zeroth law of thermodynamics, first law of thermodynamics, second law of thermodynamics, Workdone during adiabatic and isothermal process, Carnot's ideal heat engine and the efficiency of Carnot's cycle, Carnot's theorem and it's proof, refrigerator, entropy, entropy of reversible and irreversible process, third law of thermodynamics, numerical problems

UNIT IV: Thermodynamical Relations (Book-1) (Periods 11)

Introduction, Maxwell's thermodynamical relations, T-dS equations, Claussius-Clapeyron's latent heat equation using thermodynamical relations, Internal energy, Helmholtz's function, enthalpy, Gibb's function.

Recommended book:

1. Heat, Thermodynamics and Statistical Physics- Brijlal, Dr. N. Subrahmanyam, P. S. Hemne, S. Chand and Co. Ltd.

Reference books:

2. Thermodynamics and Statistical physics- Dr. S. L. Kakani
3. Heat and Thermodynamics -Brijlal,. N. Subrahmanyam, S. Chand and Co. Ltd.
4. Textbook of Heat and thermodynamics- D. S. Mathur
5. Thermal and Statistical Physics- Brijlal & N. Subrahmanyam, S. Chand and Co. Ltd.

B.Sc. I Physics Semester I

Course Code- U-PHY-137
Physics Laboratory Course-I
No. of hrs/wk: 3, Marks: 50, Credit: 1

Learning Objectives:

(1) Learning by doing' is the experimental work,
(2) To expose U.G. Students to the techniques of handling simple instruments and also make use of them in determining certain mechanical and thermal properties of matter.

Course Outcomes:

Upon successful completion of the course, students will be able to:
(1) Determine acceleration due to gravity of earth,
(2) Determine elastic properties (Young's modulus and modulus of rigidity) of material, (3) Determine and know the properties of liquid like Viscosity, Surface tension, (4) Determine thermal conductivity of bad conductor.

List of Experiments

1. Determination of acceleration due to gravity by bar pendulum.
2. Y by Spiral spring.
3. Determination of η by Static torsion method.
4. Viscosity of liquid by Poiseuille's method.
5. Surface tension of liquid by Jaeger's method.
6. Y-by bending of beam loaded at middle.
7. Setting of spectrometer by Schuster's method.
8. Thermal conductivity of a bad conductor by Lee's disc method.
9. Calibration of Spectrometer.
10. 'η' by Maxwell's needle
11. Surface tension by Ferguson's method.

*** Note: At least six experiments should be performed.**

Reference Books:

1. B.Sc. Practical Physics- Harnam Singh, S. Chand comp.
2. Practical physics- Gupta Kumar, Pragati Prakashan.

B.Sc. I Physics Semester II

U-PHY-236

Electricity and Magnetism-III

No. of hrs/wk: 3, Marks: 50, Credits: 2, Total Periods-45

Learning Objectives:

(1) To expose the undergraduate students to the fundamental laws of electricity, magnetism and their applications in day to day life,

(2) To make aware students about Gauss's and Coulomb's Law,

(3) develop understanding among the students about principles of electromagnetic induction,

(4) Acquaint students with basics of magnetostatics.

Course Outcomes:

After successful completion of the course students will:

(1) be able to state Coulomb's Law and use it to solve for E above a line of charge, a loop of charge, and a circular disk of charge.

(2) Recognize when Gauss' Law is the appropriate way to solve a problem.

(3) Calculate the torque on a magnetic dipole in a magnetic field.

(4) compare similarities and differences between the Biot-Savart law and Coulomb's Law.

(5) Use Biot-Savart Law versus Ampere's Law to calculate B fields,

(5) Determine Ballistic constant by steady deflection method.

(6) Explain the logarithmic decrement for a Ballistic Galvanometer**.**

Unit I: Electrostatics (Book-1) (Periods 11)

Introduction, flux of electric field, statement & proof of Gauss's law, differential form of Gauss's law, application of Gauss law to uniformly charged conducting sphere, Coulombs theorem, derivation of Coulombs law from Gauss's law, numerical problems

Unit II: Electromagnetic Induction (Book-1) (Periods 11)

Introduction, Faradays laws of electromagnetic induction in vector form, self-induction, selfinductance of long solenoid and self-inductance by Anderson's bridge, mutual induction, experimental determination of mutual inductance, transformer principle with current and voltage ratios, efficiency of transformer, power loss in transformer, numerical problems.

Unit III: Ballistic Galvanometer (Book-1) (Periods 11)

Introduction, moving coil type ballistic galvanometer: construction & theory, logarithmic decrement, damping correction, charge and current sensitivity, uses of B.G: absolute capacity of condenser, comparison of two capacities, numerical problems

Unit IV: Magnetostatics (Book-1&2) (Periods 12)

Introduction, magnetic induction, magnetization, relation between B, H & M, magnetic susceptibility and permeability, hysteresis curve, experiment to draw B-H curve, energy loss due to hysteresis.

Force on current carrying conductor, Lorentz force, Biot and Savart's law & its applications to straight conductor and circular coil, Amperes law, numerical problems

Recommended Books:

1. Electricity and Magnetism- R. Murugeshan, S.Chand & Company Ltd.
2. Foundations of Electromagnetic theory- John R. Reitz, Milford & R.W.Christy, IVth Edition

Reference Books:

3. Fundamentals of Magnetism & Electricity-D.N.Vasudeva, S.Chand & Company Ltd.
4. Electricity and Magnetism-D.C.Tayal, Himalaya Publishing House
5. A text book of Electricity and Magnetism-Brijlal & Subrahmanyam
6. Electricity and Magnetism-A. S. Mahajan, A. A. Rangwala
7. Electricity and Magnetism- Navina Wadhwani

B.Sc. I Physics Semester II

U-PHY-237

Basic Electronics-IV

No. of hrs/wk: 3, Marks: 50, Credits: 2, Total periods -45

Learning objectives:

(1) Develop understanding about basic electronic components and devices,

(2) Equip students with simple electrical circuits and application of semiconductor components in these electrical circuits,

(3) Enrich measuring ability semiconductor components,

(4) Empower the students to design, working and analysis of BJT amplifiers using appropriate equivalent models.

Course outcomes:

After successful completion of the course student will have skills and knowledge to:

(1) Characterize Semiconductors, Diodes, Transistors and Oscillators,

(2) Specify electronic components,

(3) Identify functions of Digital Multimeter, Cathode Ray Oscilloscope in the measurement of physical variables,

(4) Demonstrate proficiency in the use of electronic equipment and devices,

(5) Identify the importance of negative feedback in amplifiers,

(6) Design Sinusoidal oscillators for different frequencies,

(7) Solve electronic devices and systems using mathematical concepts,

(8) Design, construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis.

Unit I: Electronic Components and Instruments (Book-1) (Periods 11)

Introduction, brief idea of resistor & its types, resistor color code, inductor & its types, inductance of an inductor, reactance of an inductance, capacitor &its types, reactance of capacitor.

The multimeter & its applications, C.R.O. block diagram and its applications, numerical problems.

Unit II: Semiconductor Devices (Book-2) (Periods 11)

Introduction, P-N junction diode: construction, working & characteristics, half wave rectifier, centre tap full wave rectifier, full wave bridge rectifier (Qualitative analysis)

Special purpose diode: Zener diode, LED, photodiode and their characteristics, Zener diode as a voltage regulator, numerical problems.

Unit III: Transistors (Book-1) (Periods 12)

Introduction, PNP and NPN transistors& their symbols, action of transistor, C-B, C-E & C-C transistor configurations &their characteristics ,hybrid parameters of transistor in C-E mode, single stage C-E amplifier and its equivalent circuit (calculation of gains.), numerical problems.

Unit IV: Sinusoidal Oscillators (Book-2) (Periods 11) Introduction, positive and negative feedback, requirement of an oscillator, block diagram of an oscillator, Barkhausen criterion, Hartley & Colpitts oscillator, RC Phase shift oscillator (Qualitative analysis), numerical problems.

Recommended Books:

1. Basic Electronics solid state (Multi color illustrative edition) --- B. L. Thereja, S. Chand & Company, Vth Edition .
2. Principles of Electronics (Multi color illustrative edition)---V. K. Mehta, Rohit Mehta, S. Chand &Company Ltd, 9th Edition **Reference Books:**
3. Electronic principles---Albert Malvino, David J. Bates, 7th Edition
4. A text book of Applied Electronics--- R.S.sedha, S. Chand & Company Ltd.
5. Basic Electronics ---Bernard Grob, 9th Edition
6. Electronic Fundamentals and Applications --- John D. Ryder, Vth edition

B.Sc. I Physics Semester II

U-PHY-237

Physics Laboratory Course -II

No. of hrs/wk: 3, Marks: 50, Credit: 1

Learning Objectives:

(1) To handle and make use of simple equipment's in electricity for making error free measurements and to determine some unknown quantities

(2) To study the magnetic field produced during flow of current through the conducting wire.

Course Outcomes:

After successful completion of the course the students will:

(1) Determine the resistance of given metal wire, frequency of ac flowing through it,

(2) Study the characteristics of Zener diode, PN junction diode, CE transistor,

(3) Determine the magnetic field produced along the axis of circular coil,

(4) Estimate the figure of merit (i/d) of B.G.

List of Experiments

1. Determination of low resistance by Potentiometer.
2. Zener diode Characteristics.
3. PN junction diode Characteristics.
4. Field along the axis of a circular coil.
5. B.G.-Figure of Merit.
6. Comparison of capacities by De-Sauty's method.
7. Frequency of A.C. by Sonometer.
8. CE transistor Characteristics.
9. I-H curve by magnetometer method.
10. Study of CE amplifier.
11. Study of C.R.O. front panel board.

*** Note: At least six experiments should be performed.**

Reference Books:

1. B.Sc. Practical Physics**---** Harnam Singh, S. Chand comp.
2. Practical physics**---** Gupta Kumar, Pragati Prakashan

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Continuous Internal Assessment

Unit Test I : MCQ based Test - 30 marks

Unit Test II : Activity based Test - 30 marks

(Surprise test, Seminar, Group discussion, Poster presentation etc.)

Attendance: 05 marks

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End Semester Question Paper Pattern for Core Course: Physics I / II

Marks: 30 **Time: One and half Hour**

Q.1. Solve any three of the following.

A) One long question/ Two short questions on Unit I
Or **10 Marks**
One long question/ Two short questions on Unit I

B) One long question/ Two short questions Unit II
Or **10 Marks**
One long question/ Two short questions on Unit II

C) One long question/ Two short questions Unit III
Or **10 Marks**
One long question/ Two short questions Unit III

D) One long question/ Two short questions Unit IV
Or **10 Marks**
One long question/ Two short questions Unit IV