Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc.-I (Physics)

Syllabus

Academic Year: 2021-22

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

Curriculum Structure with effect from June, 2020

B.Sc. I (Physics) Syllabi under Choice Based Credit System

Sr. No.	Course Code	Title	Credits	Lectures /Week	Marks		
		Semester I			CIA	SEE	Total
1	U-PHY-135	Mechanics and Properties of Matter-I	02	03	20	30	50
2	U-PHY-136	Heat and thermodynamics-II	02	03	20	30	50
3	U-PHY-137	Physics Laboratory Course I	01	03	20	30	50
		Semester II					
4	U-PHY-236	Electricity and Magnetism-III	02	03	20	30	50
5	U-PHY-237	Basic Electronics-IV	02	03	20	30	50
6	U-PHY-238	Physics Laboratory Course II	01	03	20	30	50
		Total	10				300

Student Stay Hours: 09/Week

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester I

Course Code- U-PHY-135

Course Title: Mechanics and Properties of Matter-I

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 45

Learning Objectives:

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

(2) To enrich students with the knowledge of properties of fluids,

(3) To develop understanding of elastic nature of materials,

(4) To build up an understanding of fundamental physical principles,

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

(6) To equip students with the skills required for understanding of physical principles in terms of multiple representations: graphs, diagrams, equations,

(7) To 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) (Lectures 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) (Lectures 12)

Introduction, twisting couple on a cylinder, torsional pendulum, determination of coefficient of modulus of rigidity of a wire: statistical method, dynamical method Maxwell's 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) (Lectures 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) (Lectures 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.
4. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
5. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester I

Course Code- U-PHY-136

Course Title: Heat and Thermodynamics-II

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 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 of Thermodynamics.

(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) (Lectures 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) (Lectures 11)

Introduction, change of state, continuity of state, Andrew's experiment on CO_2, 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 and critical temperature, numerical problems

Unit III: Thermodynamics (Book-1) (Lectures 12)

Introduction, zeroth law of thermodynamics, first law of thermodynamics, second law of thermodynamics, Work done 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) (Lectures 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. Heat, Thermodynamics & Statistical Physics, S.L. Kakani, Sultan Chand & Sons. Publishing (2009) Revised Edition

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.

6. Thermal Physics: with Kinetic Theory, Thermodynamics and Statistical Mechanics, S.C. Garg, R.M. Bansal, C.K. Ghosh Tata Mcgraw Hill Education Private Limited (2017) Second Edition.

7. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition

8. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester I

Course Code: U-PHY-137

Course Title: Physics Laboratory Course-I

Lectures/Week: 03 Marks: 50 Credits: 01 Lectures: 45

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 Flat 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. Angle of the prism using Spectrometer
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.

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester II

Course Code: U-PHY-236

Course Title: Electricity and Magnetism-III

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 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) To 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) (Lectures 11)

Introduction, flux of electric field, statement and 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) (Lectures 11)

Introduction, Faradays laws of electromagnetic induction in vector form, self-induction, self-inductance 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) (Lectures 11)

Introduction, moving coil type ballistic galvanometer: construction and theory, logarithmic decrement, damping correction, charge and current sensitivity, uses of B.G:

absolute capacity of condenser, comparison of two capacities, measurement of charge and current, figure of merit, numerical problems

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

Introduction, magnetic induction, magnetization, relation between B, H and 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 and 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
8. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
9. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester II

Course Code: U-PHY-237

Course Title: Basic Electronics-IV

Lectures/Week: 03 Marks: 50 Credits: 02 Lectures: 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) (Lectures 11)

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

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

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

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

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

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

Introduction, PNP and NPN transistors and their symbols, action of transistor, C-B, C-E and C-C transistor configurations and their characteristics, Transistor Biasing, 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) (Lectures 11)

Introduction, positive and negative feedback, requirement of an oscillator, block diagram of an oscillator, Barkhausen criterion, Hartley and 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 and Company, 5th Edition.
2. Principles of Electronics (Multi color illustrative edition)-V. K. Mehta, Rohit Mehta, S. Chand and 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 and Company Ltd.
5. Basic Electronics- Bernard Grob, 9th Edition
6. Electronic Fundamentals and Applications- John D. Ryder, 5th edition
7. Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky, Pearson (2016) Eleventh Edition
8. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker, Wiley India Pvt. Ltd (2016) Tenth Edition
9. University Physics with Modern Physics, Hugh D. Young, Roger A. Freedman, Pearson (2016) Fourteenth Edition

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester II

Course Code: U-PHY-238

Course Title: Physics Laboratory Course -II

Lectures/Week: 03 Marks: 50 Credits: 01 Lectures: 45

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

Rajarshi Shahu Mahavidyalaya (Autonomous), Latur

Department of Physics and Electronics

B.Sc. I (Physics) Semester I and II

Question Paper Pattern

Continuous Internal Assessment

Unit Test I	Home Assignment	05 Marks
Unit Test II	Activity based Test (Surprise test, Seminar, Group discussion, Poster presentation etc.)	10 Marks (20 Marks converted into 10 Marks)
Attendance	Attendance	05 Marks
	Total	20 Marks

Semester End Examination 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 10 Marks

Or

One long question/ Two short questions on Unit I 10 Marks

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

Or

One long question/ Two short questions on Unit II 10 Marks

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

Or

One long question/ Two short questions on Unit III 10 Marks

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

Or

One long question/ Two short questions on Unit IV 10 Marks